

## *Science Education in the National Interest*

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# *Science & Technology Education Program*

**S** Science &  
**T** Technology  
**E** Education  
**P** Program

*Annual Report  
FY99*

<http://education.llnl.gov/>

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*Lawrence Livermore National Laboratory*

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***Lawrence Livermore National Laboratory***

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***Science & Technology  
Education Program***

***Annual Report  
FY99***

***November 1999***

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## Overview

**STEP Contact: Don Correll**

**URL:** <http://education.llnl.gov/>

## STEP Goals

The LLNL Science & Technology Education Program, STEP, serves as a resource to students, teachers, and faculty by facilitating research interactions with the Laboratory's world-class scientific facilities and staff. STEP also supports the science educational needs of the local and regional communities surrounding Lawrence Livermore National Laboratory (LLNL).

STEP leads the Lab's science education activities within four goals, which are to:

- 1) Facilitate research opportunities for college students entering careers important to the intellectual capability required by the LLNL national security mission.
- 2) Employ new technologies that are aligned with LLNL scientific mission for education activities.
- 3) Support teacher enhancement and curriculum improvement in topics of special interest to LLNL.
- 4) Help to increase science literacy in the communities surrounding LLNL by explaining the role of science and science careers in our nation's future.

STEP's education activities within the first three goals are sponsored by Department of Energy Defense Programs (DOE DP) funds. The DP education projects have their individual objectives; however, they share the following common overarching objective:

*Involve **students and faculty** in DP mission-related research and careers that help to ensure the availability of sufficient scientific and technical personnel to meet DOE's Stockpile Stewardship Program responsibilities.*

STEP's education activities within the last goal are sponsored by LLNL General and Administrative (G&A) funds. The G&A education projects have individual objectives; however, they share the following common overall objective:

*Provide **education outreach** activities for pre-college students which identify the important role of science and technology, and supporting careers, in ensuring our nation's national security.*

## STEP Projects and Participants

The following table lists the FY99 projects in the DP-funded "Student and Faculty" category and G&A-funded "Education Outreach" category:

## STEP Projects and Participants *continued*

Student and Faculty Projects DOE-DP Funds	Educational Outreach Projects LLNL G&A Funds
ASCI Jr. Capstone Research	Classroom Speakers Bureau
ASCI Pipeline - Northern Arizona University	Expanding Your Horizons (EYH)
ASCI Pipeline - California State University, Hayward	Explorer Post
ASCI Educational Simulations and Visualization	Fun with Science (FWS)
Military Academic Research Associates (MARA)	Future Scientists and Engineers of America (FSEA)
Actinide Sciences Summer School Program (ASSSP)	Math Challenge
Undergraduate Research Semester (URS)	Partnerships/Collaboration Efforts
National Security Cooperative Program (NSC)	Science on Saturday (SOS)
HBCU/HSI/MI Research Collaboration Program	Tri-Valley Science and Engineering Fair (TVSEF)
Defense Programs Tri-Lab Education Exhibit	
Technology Resource Center (TRC/Tower)	
Critical Issues Forum (CIF)	

FY99 participants in the first 10 of the 12 “student and faculty” projects included 124 pre-college students, 233 undergraduate students, and 57 graduate students. The FY99 total of 414 participants represents a 60% increase in numbers when compared to the FY98 total of 262. A large fraction of this growth is due to the ASCI Jr. Capstone Research project at Northern Arizona University, where undergraduate students in computational science courses were given “real-world” modeling assignments connected to the DOE Accelerated Strategic Computing Initiative (ASCI).

While attending one-day Internet workshops, 883 Technology Resource Center (TRC/Tower) participants, primarily middle-school teachers and high-school teachers from school districts surrounding the Laboratory, were introduced to Web-based materials and the Virtual Visitors Center that describe the Lab’s national security mission (<http://vvc.llnl.gov>). This number is less than half of the FY98 total because STEP staff and resources in FY99 were directed toward the student research intern activities, as discussed above.

In order to reach a national audience of pre-college and community college teachers, over 4,000 DP Education brochures were distributed to individuals who visited the DP Tri-Lab Education Exhibit at the FY99 National Science Teachers Association convention.

FY99 participants in the nine “education outreach” projects included 11,895 K-12 students who primarily attended a one-day event but in some circumstances met weekly during the school year for after-school science clubs. This number is similar to the FY98 number of 10,920 because the level of effort (funding and staff) in FY98 and FY99 was approximately the same.

Appendix 1 of the annual report provides additional participant information for all FY99 projects in both the student and faculty category and the education outreach category.

## STEP Project Descriptions and Accomplishments

Section 1 (Student Research – Undergraduate and Graduate) and Section 2 (Education Technology, Teacher Enhancement, and Curriculum Improvement – Pre-College) describe FY99 accomplishments for DP-funded student and faculty projects.

College students and faculty are placed within the DP-relevant disciplines of computations, chemistry, engineering, physics, and other related physical sciences, such as lasers and optics. College students and faculty do research within DP research areas that cover a spectrum of science topics within projects under the headings:



## STEP Project Descriptions and Accomplishments *continued*

- Computer Science/Accelerated Strategic Computing Initiative
- DOE/Department of Defense Partnerships
- Chemistry and Nuclear Materials
- Optics and Lasers/National Ignition Facility (NIF) Project

Pre-college students and teachers are introduced to technology and curricula that directly impact the national security mission of LLNL within projects under the headings:

- Education Technology
- Teacher Enhancement and Curriculum Improvement

### ***Examples of FY99 Accomplishments: Student and Faculty Projects*** *(Sections 1 and 2 of the Annual Report)*

#### ***Accelerated Strategic Computing Initiative/Northern Arizona University (ASCI/NAU) Jr. Capstone Program***

- In the spring of 1999, 120 students participated in the Northern Arizona University 386 Jr. Capstone course.

#### ***ASCI Pipeline Program***

- The ASCI Pipeline Program recruited nine NAU students for summer 1999 employment. Five of the students were participants from the six ASCI-PALS program. Of the remaining four students, three participated in NAU Jr. Capstone class.

#### ***Military Academic Research Associates (MARA)***

- LLNL Director Bruce Tarter requested a MARA "Director's Column," which ran in Newline on June 4, 1999, when the first wave of 30 cadets and midshipmen arrived for this summer.

#### ***Actinide Sciences Summer School Program (ASSSP)***

- LLNL ASSSP has been included as an educational credit through the Nuclear Engineering Department at MIT and listed as course 22.903H.

#### ***Optical Society of America (OSA)/LLNL Student Chapter – Laser Science Summer School Program (LSSSP)***

- An OSA Student Chapter was formed to initiate students to participation as a member of a professional society. The president of OSA, Professor Anthony Seigman, visited the LLNL chapter to recognize the value of the LSSSP and to review the students' accomplishments.

#### ***HBCU/HSI/MI Research Collaborations Program***

- Ten manuscripts published or submitted for publication in journals or conference proceedings in FY99.

## **STEP Project Descriptions and Accomplishments** *continued*

### ***Examples of FY99 Accomplishments: Student and Faculty Projects*** *continued*

#### ***Technology Resource Center (TRC/Tower)***

- Offered to participants in the California Technology Assistance Project (CTAP) – also known as the Digital High School Project – as a resource to help these schools provide in-service instruction to faculty. CTAP and the TRC/Tower both have the goal of preparing teachers to use computer technology as a tool to support integrated instruction. (CTAP Web site: <http://www.ctap.org>.)

#### ***Critical Issues Forum on Nonproliferation, Arms Control, and International Security (CIF)***

- STEP worked with Dr. Clay Bowen and Dr. Amy Sands from the Monterey Institute of International Studies to develop the West Coast implementation of CIF.

Section 3 (Science Literacy and Education Outreach) describes FY99 accomplishments for G&A-funded education outreach projects.

Education outreach activities play an important role in the creation of future scientists, engineers, and technicians by enlightening students about potential careers in science and technology, especially those of special interest to LLNL. Through local and regional education partnerships, STEP leads the Lab's education efforts to stimulate greater interest in science and technology among students, teachers, administrators, and the public, and to encourage more students to pursue scientific and technical careers after high school.

### ***Examples of FY99 Accomplishments: Education Outreach Projects*** *(Section 3 of the Annual Report)*

#### ***Classroom Speakers Bureau***

- One LLNL employee received the Director's Office Special Recognition Award for his volunteer efforts and dedication to this program.

#### ***Explorer Post***

- The treasurer of the Explorer Post, a young man, was awarded \$10,000 in a national science competition for his invention of an electro-optic, color-matching system for use by the visually color-impaired.

#### ***Fun with Science***

- For a second year, FWS participated in a special science Olympiad in Kings County, which is heavily populated by children of seasonal farmer workers from the California Central Valley.

## STEP Project Descriptions and Accomplishments *continued*

### ***Examples of FY99 Accomplishments: Education Outreach Projects*** *continued*

#### ***Math Challenge***

- During FY99, STEP continued to support a National Education Goal by sponsoring the 10<sup>th</sup> annual Math Challenge on May 8, 1999. Approximately 50 high school students from eight Bay Area schools participated.

#### ***Tri-Valley Science and Engineering Fair***

- A total of 225 students participated in the FY99 Tri-Valley Science and Engineering Fair; two students who were first-place winners at this year's event also won fourth place and \$500 at the Intel International Science and Engineering Fair.

## STEP Media Coverage and Awards

Activities, accomplishments, and participants associated with STEP projects continue to be profiled in community newspapers and the Laboratory's weekly employee newspaper, "Newsline." In FY99, there were 25 articles associated with the "student and faculty" projects of Sections 1 and 2, and 55 articles associated with the "education outreach" projects of Section 3. Media coverage is discussed project by project in Sections 1 and 2 and collectively for all projects in Section 3. The total of 80 articles in FY99 represents more than one article per week about STEP activities being recognized by the news media.

A Science & Technology Reporters Workshop, held on June 9, was co-sponsored by STEP and LLNL Public Affairs Office to help local and regional reporters understand how the Lab's science mission and science discoveries can best be communicated to their readership. Science reporters and editors from the Annenberg School for Communication, Modesto Bee, Reuters America, Sacramento Bee, San Francisco Chronicle, and TechWeek were in attendance.

In addition to the media coverage recognition, STEP received eight awards from the education and government sectors for its contributions in FY99. Those awards were:

- University of Pacific (UOP) Engineering Industry Fellowship Sponsor
- California Teachers Association "Special Friends of Education" Award
- California Cooperative Education Association (CCEA) Award as "Outstanding Cooperative Education Employer"
- Chancellor's Office California Community Colleges award for "Participation on the Cooperative Work Experience Education & Placement State Advisory Committee"
- Pleasanton Partnerships in Education Foundation Award
- Certificate of Recognition as a "Special Friend of Education" from the Tracy Rural Educators Association
- State of California Senate 5th District, Certificate of Recognition in honor of "Receiving a Special Friend of Education Award from the San Joaquin County California Teachers Association Coordinating Council"
- Certificate of Recognition from the California State Assembly in honor of "Receiving the Golden Apple Special Friend of Education Award from the Tracy Rural Educators Association"

## **STEP Initiatives with the State of California and University of California**

Section 4 of the annual report describes two initiatives that were begun in FY99 to assist the University of California (UC) with its pre-college, science education activities within the State of California, especially in technology areas based in the Laboratory's science. The school-to-career initiatives – Crystals in the Classroom, and Laser Science and Optics in the Classroom – involved numerous partners from various education institutions that provided either funding or in-kind service to support the two initiatives:

- University of California, Merced
- Center for Advanced Research and Technology (CART)
- Fresno Unified School District
- Merced Unified School District
- San Ramon Unified School District
- Los Angeles Unified School District
- Pleasanton Unified School District
- San Jose State University
- Diablo Valley Community College
- San Francisco Exploratorium
- San Jose Technology Museum

Crystals in the Classroom and Laser Science and Optics in the Classroom will help provide more inquiry-based, hands-on science activities that support the State of California's new Science Framework built around the new California science standards. The accomplishments from the Crystals in the Classroom initiative were reported in the scientific meeting of the Optical Society of America in September 1999 and will be reported in the scientific meeting of the American Chemical Society in March 2000.

For the past few years, STEP has worked closely with the California Cooperative Education Association, CCEA (<http://www.careers.csulb.edu/~ccea/>) which serves as a source of information about cooperative education and work-integrated learning to California students and residents. The 1999/2000 CCEA president is a STEP staff member.

In addition to working with CCEA in FY99, STEP began to partner with the California Alliance for Minority Participation, CAMP (<http://www.camp.uci.edu/index.html>). CAMP is a UC/California State University/State of California program that aims to support and retain undergraduates to achieve their degrees in the fields of science, mathematics, and engineering.

Appendix 2 provides reprints from the CCEA Experience Matters, June 1999 issue, "A Business Partnership with Cooperative Education" and from the CAMP Quarterly, Spring 1999 issue, "Science in the National Interest." These two reprints discuss STEP's participation with these two state-wide associations which have a "school-work/research-career" theme to their activities.

## STEP Directions for FY00

STEP will continue with its dual role of managing the Laboratory's efforts in facilitating research interactions of students, teachers, and faculty with the Laboratory's world-class scientific facilities and staff, and supporting the science education needs of the Lab's local and regional communities. Having both of these two areas of the Laboratory's education initiatives within STEP's organization reflects the recommendations defined recently by the Task Force on Education of the DOE's Secretary of Energy Advisory Board, SEAB (December 2, 1998, Final Letter Report, <http://vm1.hqadmin.doe.gov/seab/educ.html>). The Final Letter Report stated:

"The Task Force believes the Department's mission justifies its dual role in educating future scientists, as well as in improving the public understanding of science:

1. Ensuring a steady flow of scientists directly supports the Department's mission of maintaining a well-trained future laboratory workforce. Students with scientific aptitude should have opportunities at the Department's national laboratories and facilities where they can obtain the specialized research skills and hands-on experience working on projects that are unique to government research and development.
2. It is also in the Nation's best interest for the Department to use its resources to enhance public understanding of science. Citizens who have knowledge of science and technology are better-informed voters. The effect is to raise the quality of decision-making and of understanding and support for the Department's multifaceted programs and projects. Everyone learns math and science in grade school, and at this level teachers have an impact on both potential scientists and average students."

The first of the two SEAB Task Force on Education recommendations falls within STEP's "student and faculty" projects, and the second falls within STEP's "education outreach" projects.

In the area of DP-funded "student and faculty" projects, there will be even more emphasis at the undergraduate and graduate student level. Student and faculty participants will be further aligned with the critical-skills, workforce needs identified by the Commission on Maintaining U.S. Nuclear Weapons Expertise (Chiles Report, March 1, 1999, <http://www.dp.doe.gov/public/chilesrpt.htm>)

In the area of G&A-funded "education outreach" projects, there will be additional partnerships formed with the education community to further align activities with the new science standards of the State of California. Through partnerships with the education community, STEP plans to assist the education community in its quest for new sources of funding, such as the National Science Foundation.

STEP will continue to interact closely with other LLNL education activities managed within the Laboratory but funded by other sources. Appendix 3 lists additional programs at LLNL with education activities. Appendix 3 also provides a summary of LLNL student and faculty opportunities other than those managed by STEP.

Appendix 4 provides information on the STEP organization and staff who support Lawrence Livermore National Laboratory in maintaining an education component within the LLNL Web site banner "Science in the National Interest" (<http://www.llnl.gov>).

While the STEP Web site (<http://education.llnl.gov>) is continually updated to reflect the status of its education activities, the banner will remain the same in FY00 as it has in previous years, "Science Education in the National Interest."

## **Section 1 – Student Research Opportunities (Undergraduate and Graduate)**

### **Introduction**

The STEP student research opportunities at LLNL complement the educational and research opportunities provided by colleagues at other institutions, such as Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL). Student interns who have been involved in the Laboratory's mission-based science have received valuable research experiences, which, in turn, have supported their educational and career goals. Exposing interns to scientific research and scientific careers will increase the number of successful students who choose careers of importance to the LLNL science and technology mission. Therefore, STEP offers numerous internships to undergraduate and graduate students that provide opportunities to become part of our world-class workforce and to use the Laboratory's state-of-the-art facilities.

### **Computer Science/Accelerated Strategic Computing Initiative**

## **Accelerated Strategic Computing Initiative/ Northern Arizona University (ASCI/NAU) Jr. Capstone Program**

**STEP Contact: Barry Goldman**

**URL:** [http://education.llnl.gov/step\\_student.html](http://education.llnl.gov/step_student.html)

### **Description**

The goal of the Jr. Capstone Program is to increase the numbers of Native American and other minorities working in the new scientific discipline of high-performance, computer-based modeling and simulation. The program involves DOE, Lawrence Livermore National Laboratory, the University of Utah, and IBM. Northern Arizona University serves many students of Native American heritage. Students in the NAU Engineering Program will have the opportunity to work on the next generation of supercomputers and experiment with distance learning.

The LLNL Jr. Capstone Program component allows university students an opportunity to take the theory they have been learning and apply it to ongoing problems. Students will have an opportunity to apply their classroom instruction to real-life problems, intended to be ASCI-related and involving simulation and modeling. Topics will be selected by NAU faculty in collaboration with LLNL technical staff to match the student research interests and strengths to provide the best research training for the undergraduate participants. In FY99, this pilot ran in four sections or departments (civil and environmental engineering, electrical engineering, mechanical engineering, and computer science).



## Description *continued*

Regarding the 386 Jr. Capstone course component, the identified problems are solvable by a small team of students and the students are telementored by researchers and their faculty. Basically, this will allow students the opportunity to apply their education to a project and produce something meaningful. Experience has shown this motivates them to pursue advanced degrees. In addition, the program provides career awareness or a pipeline to the ASCI Initiative while also exposing the students to state-of-the-art problems and challenges while still in the classroom.

Additional components of the collaboration may include mentoring, Academic Excellence Workshops, distance learning, guest speakers/lecturers, seminars, and tours – including field trips. Summer students will be recruited from recommendations of the 386 Jr. Capstone faculty, participants in the ASCI-PALS (Pathways Leading to Success) program, and general recruitment efforts. Applicants will then be matched to potential projects with ASCI researchers for summer employment.

## Partners

### Laboratory:

- Accelerated Strategic Computing Initiative
- Defense & Nuclear Technologies and the Computation Directorate

### Non-Laboratory:

- Northern Arizona University
- University of Utah/CSAFE
- IBM Corporation

## Goals, Objectives, and Metrics

- Help to ensure a highly-skilled, diverse workforce consistent with science and technology needs within DOE Defense Programs mission and goals. **Metric:** Determine the number of students who pursue graduate degrees in ASCI at an Alliance school or ASCI careers.
- Advance the use of the Internet, computer science, and simulation technologies to introduce students to DOE work, with a special emphasis on national security relevant disciplines. **Metric:** Pilot the 386 Jr. Capstone course across multi-disciplines at NAU; determine the quality of the student learning as evaluated by the 386 faculty.
- Enhance national security and civilian scientific and technical literacy, with appropriate appreciation for and sensitivity to the cultural diversity within the community, state, and nation. **Metric:** Evaluate the quality of the student responses as observed by DOE Defense Programs and LLNL ASCI personnel during the final presentations.

## Evaluation/Assessment

Evaluation instruments are being piloted between LLNL and NAU. The intent is to design questionnaires for the students so that their computer science skills, educational and career objectives can be assessed before and after participation in the course.

The goal of this program aims to increase the numbers of Native American and other

## Evaluation/Assessment *continued*

minorities working in the new scientific discipline of high-performance, computer-based modeling and simulation. Of the nine NAU participants in the LLNL summer program and a total of six NAU ASCI-PALS (Pathways Leading to Success) students, five were summer students at LLNL. The sixth ASCI-PAL student had accepted an LLNL offer, changed her mind, then accepted again, and ultimately declined. All of these students are underrepresented, except one who is a female in the sciences. The remaining students are all participants from the Jr. Capstone course. This summer's participants clearly reflected an increase in the number of Native American and other minorities working with ASCI and gaining exposure to ASCI careers.

Students tend to be educated within a discipline (e.g., electrical engineering, mechanical engineering, civil engineering) and are not fond of interaction among disciplines. Research at LLNL is multidisciplinary and demands the ability to interact between disciplines. One of the objectives of Jr. Capstone is to bring diversity into ASCI. This not only means diversity through ethnicity but diversity in approaches to problem-solving, particularly involving a team environment between disciplines. The NAU 386 course (or Jr. Capstone) is the one course that is recognized at NAU as being the most likely to address this need.

## FY99 Accomplishments

### ***ASCI/NAU Jr. Capstone Program***

- A technical representative from ASCI, Jean Savy, traveled to NAU to present to students in the 386 Jr. Capstone class. Savy is co-director of the LLNL Hazards Mitigation Center.
- Facilitated a field trip for eight students from NAU and the 386 class (primarily civil) to Yucca Mountain.
- In the spring of 1999, 120 students participated in the NAU 386 Jr. Capstone course.
- Facilitated arrangements for housing, summer employment, and matching of assignments to student interest for nine NAU students at LLNL.

## Workshops and Events

Event Name	Number of Events	Event Purpose	Location(s)	Speaker(s)
Seminar	1	Seminar on Special Materials Distribution	NAU Campus	Jean Savy
NTS/Yucca Off-site Meeting	1	Tours/modeling and simulation of NTS and Yucca Mountain		Various



## Accelerated Strategic Computing Initiative (ASCI) Pipeline Program

**STEP Contact:** *Barry Goldman*

**URL:** [http://education.llnl.gov/high\\_performance\\_computing/](http://education.llnl.gov/high_performance_computing/)

### Description

The goal of this project, as stated by DOE management, is to “increase the students majoring in computer science, particularly under-represented minorities who represent America’s ethnic diversity, and their awareness of ASCI opportunities at DOE Defense Programs laboratories.”

- This program will increase the students’ awareness of ASCI opportunities at DOE Defense Programs laboratories. Students will work at the Lawrence Livermore National Laboratory for approximately 12 weeks on a variety of different projects in ASCI and Computation, which will ensure they have access and exposure to high-level computational science.
- Summer students will be recruited from recommendations of math and computer science faculty, as is the case of California State University, Hayward, and general recruiting efforts at specific ASCI academic institutions. In the case of Northern Arizona University, these recommendations may come from the 386 Jr. Capstone course faculty, participants in the ASCI-PALS (ASCI-Pathways Leading to Success) program, the Multicultural Engineering Program, and also general recruitment.
- All participants will be required to design an electronic portfolio, give an oral presentation to peers within their work group, and write an abstract and paper on their project.

### Partners

Laboratory:

- Accelerated Strategic Computing Initiative
- Defense & Nuclear Technologies and the Computation Directorate

Non-Laboratory:

- California State University, Hayward
- Northern Arizona University
- University of Utah

### Goals, Objectives, and Metrics

- Fulfill a need for U.S.-citizen, computer-science graduates with some background in a parallel-processing environment. **Metric:** Evaluate the number and percentage of students who are offered and accept positions in this field, and the number that are hired in higher-ranking categories.

## Goals, Objectives, and Metrics *continued*

- Contribute toward fulfilling a need for U.S. citizens to convert existing linear-processing code to a parallel-processing environment. **Metric:** Determine how many lines of code have been converted.
- Meet the needs of the job market to such an extent that it is continuously full, including the condition of a high turnover of employees because of market competition in this job category. **Metric:** Determine if project can respond to increases/decreases in number of B.S. graduates required in a time frame consistent with market swings and position openings and still maintain a sustainable program.
- Increase capability, capacity, and quality at a nearby university for B.S. level graduates in computer science. **Metric:** Establish accreditation with professional societies such as the Association for Computing Machinery (<http://www.acm.org>). **Metric:** Engage faculty with tenure and recognition to teach specialty courses, such as parallel processing (without the need of Laboratory staff).
- Provide graduate opportunities at the first-level ASCI Alliance schools. **Metric:** Establish memoranda of understanding between alliance level institutions and targeted four-year colleges to promote graduate opportunities and lab hires – M.S. and Ph.D. Involve the four-year computer science departments to help ensure that their B.S. graduates are capable of entering the ASCI Alliance graduate schools.
- Involve the computer industry, e.g. , IBM, Silicon Graphics, etc., for equipment, training, fellowships, etc. **Metric:** Establish an appropriate computer laboratory to conduct the B.S. computer science (parallel processing) program.

## Evaluation/Assessment

Evaluations, in general, are ongoing and include a variety of instruments, such as reflective feedback, focus meetings with the supervisors and students, personal meetings, questionnaires, seminar discussion groups, results of the various classes, and participant accomplishments. At the conclusion of the program, the students will evaluate their actual experiences. The following summary reflects input from the student participants and their research mentors:

LLNL researchers, STEP staff, and NAU students mutually agreed that efforts to recruit and facilitate summer employment at LLNL were hurried because of the newness of the project. As a result, many students had to wait for their clearances before being able to start their employment. Additionally, project assignments and matches took place after their arrival. This left little time to arrange for office space and provide necessary equipment. On the positive side, the students knew this was happening before accepting their offers. They were patient during the process and did not let delays lessen the value of their experience.

STEP staff will begin summer employment recruiting in January. STEP will also screen applicants and facilitate matches to project assignments and researchers in time to initiate security clearances for mid-May arrival/start dates. STEP will be storing equipment purchased for the FY99 participants, to be used in support of this initiative in following summers.

## Evaluation/Assessment *continued*

Students acquired skills in Message Passage Interface (MPI); C programming language , Extensible Markup Language (XML); parallel and network programming; rapid prototype machines; visualization; Concurrent Versions System (CVS); data mining; writing papers; and giving presentations.

Regarding the presentation and scientific writing workshops, the feedback was mixed. Some students felt they already had taken similar courses yet also felt it was a good review and found the instructors' ideas quite useful.

One hundred percent of the participants indicated their LLNL experience broadened their awareness of ASCI careers.

The responses included: "It helped me think about work and/or future schooling possibilities" and "I never actually thought of working in a lab as a career but now it is a possibility." In most cases, the experience seems to reinforce and/or motivate the students to pursue their academic interests, not redirect them. However, one student did say it has redirected his interest in networking and parallel programming.

## FY99 Accomplishments

### ***ASCI Pipeline Program***

- Recruited nine NAU students for summer 1999 employment, five of the students were participants from the six ASCI-PALS program. Of the remaining four students, three participated in NAU Jr. Capstone class.
- Recruited three CSUH students and one faculty for the summer 1999 employment.

## Publications and Presentations

- Research papers and abstracts reflecting the students' summer projects are undergoing LLNL review and release for distribution.

## Media Coverage

- "Summer students get diverse lessons on ASCI from DOE's Weigand," Newslines, July 9, 1999, [http://education.llnl.gov/news/jul/07\\_09\\_asci.html](http://education.llnl.gov/news/jul/07_09_asci.html)
- "Livermore lab aims young for computer scientists," Contra Costa Tri-Valley Business Times, March 18, 1999, <http://education.llnl.gov/FY00proposals/proposals.html>

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Cyber Security	1	Briefings	Hosting Directorate	Video Tapes
Design & Delivery	1	Oral Delivery Workshop	B415	Mike Gennin
Adaptive Optics	1	Seminar	B361	Brian Bauman
Visualization	1	Tour	Sandia, B911	Jerry Friesen
KDP Crystal Growth	1	Tour	B1678	Natalia Zaitseva
Accelerator Mass Spec.	1	Tour	B361	John Knezovich
Biological Dosimetry	1	Seminar	B361	Joe Lucas
Scientific Writing	1	Research Papers and Abstracts Workshop	B415	Carol Hall
Research Process	1	Overview	B415	John Knezovich
Iraq Inspections	1	Seminar	B361	Jacqueline Kenneally
Environmental Restoration	1	Seminar	B361	Tina Carlsen
Integrated Safety Management	1	Briefings	Hosting Directorates	Claire Max, Don Correll
What is Applied Science	1	Seminar	B543	Jeff Wadsworth
NIF	1	Seminar	B543	Bill Hogan
Computer Modeling	1	Seminar	B543	Tomas Diaz de la Rubia
Earthquakes	1	Seminar	B361	Erna Gras
Nova/NIF	1	Tour	B481	Tour Guide

## Accelerated Strategic Computing Initiative (ASCI) Educational Simulations and Visualization

**STEP Contact: Richard Farnsworth**

**URL:** [http://education.llnl.gov/step\\_educator.html](http://education.llnl.gov/step_educator.html)

### Description

The purpose of the Accelerated Strategic Computing Initiative Educational Simulations and Visualization project is to bring to the student's desktop the rich resource of high-performance computing and scientific visualization, adapted from the ASCI computing tools, currently only available to the scientific community. Through use of these tools for further scientific investigation, we expect that students will explore many difficult concepts and topics previously only investigated by research scientists.

## Partners

Laboratory:

- Computations Directorate
- Public Affairs Office

## Goals, Objectives, and Metrics

- Demonstrate the unique computational capabilities of ASCI to teachers and students and give them access to computing tools and resources. **Metric:** Web site describing the ASCI program continues to be active.
- Provide access to LLNL computational resources otherwise unavailable to the education community. **Metric:** New supercomputer, soon to be made available to selected teachers and students, will be evaluated for interest and usage and monitored for daily use.
- Create virtual reality tours of Atmospheric Release Advisory Capability (ARAC), Nova, ASCI, and, in the future, the National Ignition Facility (NIF). **Metric:** Total usage of the Virtual Visitors Center Web site and CD-ROM.

## Evaluation/Assessment

This project was not formally evaluated during FY99 due to the change in hardware to add parallel processing capabilities.

## FY99 Accomplishments

### *ASCI Educational Simulations and Visualization*

- Added changes and an exhibit for Defense and Nuclear Technologies (DNT) to the Virtual Visitors Center. Also created Web pages describing the work done in DNT
- Duplicated 12,000 Virtual Visitors Center CD-ROMs for distribution to the public. Currently over 6,000 CD-ROMs have been distributed.
- Procured a Silicon Graphics Inc. Onyx2 supercomputer as a replacement for the Cray YMP-EL.
- In collaboration with the Public Affairs Office and the Visitors Center, installed the new SGI Onyx2 supercomputer in the Visitors Center.
- Started to work on the Virtual Visitors Center version 2.0 that will include more information about National Security and include a new section on recruiting and applying for internships.

## **Military Academic Research Associates (MARA)**

**STEP Contact: Barry Goldman**

**URL:** <http://education.llnl.gov/military/>

### **Description**

The goal of the Military Academic Research Associates program is to foster a stronger relationship with the military and enhance the tie between the Department of Defense (DoD), Lawrence Livermore National Laboratory, the Department of Energy, and the Office of Defense Programs. LLNL has been working with the undergraduate military academies as well as several of the graduate institutions to provide internship opportunities for military cadets/midshipmen. This goal of these internship experiences is to enhance learning and achievement in science through hands-on research experiences. The military cadets and midshipmen are given the opportunity to participate in ongoing collaborative, multi-disciplinary teams pursuing scientific and technical solutions to some of our nation's most challenging problems, many of which address areas critical to national defense.

Cadets/midshipmen are recruited through partnerships with the Air Force Academy, the Naval Academy, the Naval Postgraduate School, the Air Force Institute in Technology, West Point, and others. Thus far, we have successfully partnered with all of the aforementioned academic institutions to provide summer experience tours and semester internships. We will aggressively recruit projects for cadets/midshipmen in the fall and these will be communicated to students in January. Cadets/midshipmen bid on assignments in February with final decision on their summer tours being resolved in March and April. Discussions are also taking place to encourage teams of cadets/midshipmen and faculty to experience research at LLNL.

### **Partners**

#### **Laboratory:**

- Defense Programs Directorates within LLNL and Sandia National Laboratories

#### **Non-Laboratory:**

- US Naval Academy (USNA)
- US Air Force Academy (USAFA)
- Naval Postgraduate School (NPS)
- Air Force Institute of Technology (AFIT)
- US Coast Guard (USCG)
- Reserve Officer Training Corps (ROTC)
- West Point (USMA)



## Goals, Objectives, and Metrics

The DOE-DP mission and benefit is to help shape the cadets' and midshipmen's capabilities to understand the broader defense capabilities of the country – including those that reside at the Lawrence Livermore National Laboratory.

- Expose cadets/midshipmen and graduates to military research at LLNL. **Metric:** Evaluate the number of cadets/midshipmen and graduates placed in hands-on research experiences.
- Facilitate civilian/military faculty and research collaborations. **Metric:** Initiate discussions between LLNL and the US Air Force in support of HyperSoar and other collaborations.
- Ensure that cadets/midshipmen benefit from the technology experience, the networking, publications, and exposure to issues of national defense. **Metric:** Evaluate the quality of student responses to STEP assessments (as judged by STEP personnel); mentor opinions of quality of students' work; the ability of students to work with little supervision.

## Evaluation/Assessment

Evaluations in general are ongoing, and include a variety of instruments, such as reflective feedback, focus and personal meetings, questionnaires, seminar discussion groups, results of the various classes, and cadet/midshipmen products. Input from questionnaires includes the following:

Research experiences allowed participants to work on real-life problems, many involving issues of national interest. The projects provided the opportunity to apply classroom theory to applications in a state-of-the-art research institution. One respondent said, "I could not have asked for a better research project. It matched my interests perfectly. The only way it could have possibly been better would have been to be here for a longer amount of time." Ninety-five percent of the survey participants rated their experience very good to excellent. In most cases, their only request was for more time to do more research as they felt limited in what could be accomplished in four to six weeks. Still, they generally felt they contributed to the success of a research project.

There was a concentrated effort in FY99 to increase the interactions between researchers and cadets/midshipmen before their arrival. This was extremely successful and reflects input from the participants. Approximately half of the participants felt there was little time, while still at the academies, to prepare for their lab experience while others felt it was an integral part of the preparation process. Without a doubt, more frequent interactions, even if only a weekly e-mail, increased the participant's feeling of being a team member.

Once on the assignment, cadets and midshipmen felt the resources, working conditions/facilities to accomplish their work was more than sufficient. Furthermore, they generally agreed their mentors were available and easy to communicate with. Of those responding to the exit survey, 86% felt they increased their technical knowledge as a result of the internship. When asked how the program was meaningful, one cadet said, "This afforded me the opportunity to see how science has really impacted the military and my future in it, as well as allowing me to see what I may be able to do for the military in the future." Another stated, "The program is strong in that it takes the scientifically oriented students out of a military program long enough to show them that they can continue to serve the military and the

## **Evaluation/Assessment** *continued*

nation through technical and scientific skills.”

A number of educational deliverables were incorporated into the program in FY99. We requested that participants complete a research paper with abstract and give a technical presentation about their project to their working peers before the end of their assignment. Additionally, we requested they participate in weekly seminars/tours and that they develop an electronic portfolio on their research project. In preparation for the paper/abstract and oral presentation, we provided workshops on scientific writing, technical presentations, and an overview of the research process.

The general consensus from the cadets and midshipmen was that they did not have sufficient time to adequately support their research project in four to six weeks and comply with all the educational requirements. Unlike universities, the academies require the cadets and midshipmen to be good communicators. Therefore, instead of full-day workshops on design and delivery and technical writing, it should be sufficient to provide a one-hour class on writing abstracts and tips for oral/technical presentations. In the future, these components should be optional rather than required.

## **FY99 Accomplishments**

### ***Military Academic Research Associates***

- MARA continued to grow at LLNL. In FY99, 30 cadets and midshipmen participated in a summer research experience at LLNL (a 36% increase from FY98).
- Academy participants were required to prepare individual electronic portfolios and presentations to their respective programs at the end of the assignment. Classes were provided for design and delivery, and scientific writing; a modified research process briefing was given.
- Instead of a full Academy Day this summer, the assistant associate director for Military Affairs for the National Security Directorate gave two briefings to all incoming MARA participants. Cadets and midshipmen participated in twice-weekly noontime briefings or tours of DoD and military research at the Lab. Lab Military Research Associates also participated in this initial briefing to meet and network with the participants.
- LLNL Director Bruce Tarter requested a MARA “Director’s Column,” which ran in Newslines on June 4, 1999, when the first wave of 30 cadets and midshipmen arrived for this summer.
- LLNL and Sandia/CA jointly hosted a Reserve Officer Training Corp (ROTC) Day on October 9, 1998, which included eight cadets from California State University, Sacramento and the University of California, Berkeley. Two of the eight participants expressed interest in the Undergraduate Research Semester (URS); one has since applied for the fall 1999; another is talking about applying for the spring 2000 term.



## **FY99 Accomplishments** *continued*

### ***Military Academic Research Associates*** *continued*

- The October ROTC Day led to a second ROTC Day, held on April 27, 1999. It included representatives from almost every Detachment in the State. Sixty-two participants from every military branch met with 12 lieutenants, colonels and captains, including Col. Gesch, the Commander of the AFROTC from the Montgomery Air Force Base in Alabama.

## **Publications and Presentations**

- “Lab Work,” Air Force Magazine, July 1999, p. 90.  
[http://education.llnl.gov/news/jul/07\\_01\\_rotc.html](http://education.llnl.gov/news/jul/07_01_rotc.html)
- Presented the ROTC program to approximately 25 Captains and Colonels who attended the annual Professional Military Science Conference May 17 in Monterey.
- Presented MARA and the proposed ROTC National Security Intern program to General Newton on August 17, 1999. Newton is the commander of the U.S. Air Force’s Air Education and Training Command. In addition to training and recruitment of Air Force personnel, this includes the Air University, Air Force Officer Accession and Training and the AFROTC (Col. Wolfgang Gesch).
- Provided input to Col. Tom Adang, UC, Berkeley, who with Cadet Steve Brown, is drafting an article to be published in the Academic Exchange Quarterly (AEQ), a quarterly, refereed journal, which is distributed in 37 states.

## **Media Coverage**

- “Livermore hosts military student interns,” DOE This Month, September 1998, p. 5,  
[http://education.llnl.gov/news/98/09\\_01\\_mara.html](http://education.llnl.gov/news/98/09_01_mara.html)
- “Military Cadets Seek Marching Orders For Lab Research,” NewsOnLine, February 16, 1999, [http://education.llnl.gov/news/feb/02\\_16\\_mara.html](http://education.llnl.gov/news/feb/02_16_mara.html)
- “ROTC Midshipmen & Cadets Tour Lab on Tuesday,” NewsOnLine, April 26, 1999,  
[http://education.llnl.gov/news/apr/04\\_23\\_mara.html](http://education.llnl.gov/news/apr/04_23_mara.html)
- “Educating the next generation,” Newsline, April 30, 1999,  
[http://education.llnl.gov/news/apr/04\\_30\\_rotc\\_urs.html](http://education.llnl.gov/news/apr/04_30_rotc_urs.html)
- “MARA marching forward with programs for cadets,” Newsline, June 4, 1999,  
[http://education.llnl.gov/news/jun/06\\_04\\_mara.html](http://education.llnl.gov/news/jun/06_04_mara.html)
- “Students take their studies to the lab,” Tri-Valley Herald, July 19, 1999,  
[http://education.llnl.gov/news/jul/07\\_19\\_lsssp.html](http://education.llnl.gov/news/jul/07_19_lsssp.html)

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Mini-Academy Days	2	Profile LLNL/Sandia DoD Military Research	LLNL/Sandia, CA briefings; tours included Nova, ARAC, High Explosive Applications Facility and Conflict Simulation Lab	George Sakaldasis, Ron Lehman, Lloyd Wayne Brasure, George Miller, Chuck Oien (Sandia/CA), Maj. Park Winter, Edward Teller, William Bookless, Howard Powell
ROTC Days	2			
Lecture	1	Overview of Bioscience	B131	Anthony Carrano
Workshop	1	Technical Writing	B415	Carol Hall
Lecture	1	Research Process	B415	John Knezovich
Lecture	1	Overview of Nonproliferation Arms Control/International Security	B131	Tom Ramos
Lecture	1	LLNL DoD Research		
Lecture	1	Radio Nuclides at Nevada Test Site	B131	Dave Smith
Workshop	1	Presentation Skills	B415	Mike Genin
Lecture	1	Lasers for DoD	B415	Brent Dane
Tour	1	Site 300	B415	Jim Lane

## Chemistry and Nuclear Materials

### Actinide Sciences Summer School Program (ASSSP)

**STEP Contact: Barry Goldman**

**URLs:** <http://education.llnl.gov/asp/>

[http://www-cms.llnl.gov/private/seaborg\\_asssp\\_site/](http://www-cms.llnl.gov/private/seaborg_asssp_site/)

#### Description

The goal of the Actinide Sciences Summer School Program is to address the long-term manpower and core-competency needs of the defense-related programs within DOE in support of Actinide Science. To accomplish this, we have partnered with the Glenn T. Seaborg Institute for Transactinium Sciences (GTS-ITS) at LLNL, whose purpose is to provide education and research training in transactinium science for undergraduate and graduate students. Through this partnership the ASSSP is aimed at undergraduate students who have shown an interest in the field of nuclear science, at the Nuclear Summer Schools at San Jose State University, and Brookhaven National Laboratory. These summer school programs are

## Description

funded by the DOE/Basic Energy Science (BES) and sponsored by the American Chemical Society.

The LLNL ASSSP program builds on the classroom education and offers each student a “hands-on” scientific laboratory research project with actinides using state-of-the-art instrumentation. It is essential to encourage the students’ interest in this field at the undergraduate level and encourage their pursuit of graduate studies or careers in actinide sciences.

The importance of the ASSSP is intensified by the shortage of actinide experts at DOE facilities and, in fact, the world. This sector of the scientific community continues to retire, leaving ever-widening gaps in the core capabilities of the programs and disciplines throughout the DOE complex.

Student participants in this project are partnered with Laboratory scientists on research projects where they are offered hands-on laboratory experience with plutonium and other actinides. The ASSSP students are being partnered with LLNL staff scientists on current research projects in the areas of actinide migration and nuclear waste disposal in the geosphere; separation chemistry of actinide and fission products related to nuclear diagnostics; modern spectroscopic methods for the detection and speciation of actinide colloids; actinide interactions at the mineral water interface; geochemical modeling with actinide systems; molecular modeling and electronic structure calculations of actinides; and application of X-ray synchrotron radiation methods to actinides.

A distinguished lecture series features leading scientists in the actinide science field from other national laboratories, and professors from Massachusetts Institute of Technology (MIT); University of Washington; University of California, Berkeley; University of Tennessee; and San Jose State University. These seminars are followed up with a one-on-one interaction in settings that encouraged dialogue between the guest lecturer and the students.

In addition to LLNL program staff, carefully-selected technical experts serve as individual mentors and counselors for educational possibilities that the students may wish to pursue. In addition, the ASSSP coordinator met daily with the students to assist them with any questions or issues.

The students were required to prepare scientific posters on their research projects. A poster presentation session of the students work took place on August 5, 1999, and was attended by members of LLNL senior management, scientific staff from across the directorates, STEP representatives, as well as by professors from the University of California, Berkeley.

## Partners

### Laboratory:

- Glenn T. Seaborg Institute for Transactinium Science
- LLNL Chemistry and Materials Science, Engineering, and Energy Directorates

### Non-Laboratory:

- American Chemical Society, Brookhaven and San Jose State University (ACS Radiochemistry Summer Schools)
- Los Alamos National Lab and the University of New Mexico, U.S. student participants, U.S. universities, i.e., UC, Berkeley; University of Tennessee; Massachusetts Institute of Technology; Washington State University

## Goals, Objectives, and Metrics

- Help the Laboratory and DOE educate and train the future generation of scientists in the knowledge and expertise required to meet the nation's changing needs in environmental protection and remediation, nuclear waste isolation, national security, nuclear surveillance, nuclear energy and industrial applications of nuclear methods. **Metric:** Evaluate the number of students who pursue advanced degrees in actinide science and/or who pursue careers at DOE within the field. Survey the student participants and their mentors at the end of the program to assess the ASSSP.

## Evaluation/Assessment

Feedback from earlier summer programs hosted by the GTS-ITS has indicated that many bright individuals are stimulated by this scientific experience early in their educational careers and have been encouraged to continue in a technical career. For this project, an evaluation template is being used to conduct a formative assessment of the participants in addition to exit interviews to obtain direct feedback and indication of goal attainment. The entire project will be reviewed by external experts as part of the Chemistry & Material Science Directorate's review process.

Evaluations of the ASSSP included a variety of instruments, such as student/ASSSP coordinator and mentor daily interactions and feedback, as well as scientific seminars followed up with group discussion. At the end of the ASSSP program, each student completed an evaluation survey questionnaire. The questionnaire includes rating the scientific interests and the research project the students worked on; their relationships with their mentors and the ASSSP coordinator; to what extent they were prepared to complete their scientific tasks; their access to office and lab space; opportunities they had to be able to provide input into their research project; as well as asking them to rank each of the lecture series presenters. The students rated their FY99 ASSSP experience from very good to excellent. In most cases, the main concern expressed was that the ASSSP program should be extended an additional two to three weeks to allow the students more time to conduct their scientific research.

The ASSSP student selection committee, comprised of university professors and Laboratory actinide experts, worked diligently to match each student with a scientific project mentor. Students were contacted early in the process and were asked to complete a questionnaire to determine the type of laboratory research experience in which they were interested. When the students returned the completed questionnaire, the ASSSP coordinator contacted possible mentors for the students. The suggested mentors then contacted the individual students to discuss the scientific projects that they had to offer to ensure that there was a match between skill set and interest in the projects. During the duration of the ASSSP the GTS-ITS Director, Deputy Director, ASSSP Coordinator and student mentors were available to speak with each of the students daily and to assist them with any issues or concerns.

A distinguished lecture series featured leading scientists in the actinide science field from other national laboratories and professors from MIT, University of Washington, University of California-Berkeley, University of Tennessee, and San Jose State University. These seminars were followed up with a one-on-one interaction in settings that encouraged dialogue between the guest lecturer and the students. The students rated this lecture series as excellent and stated that they were given the opportunity to hear and meet with such distinguished scientists as Professor Darleane Hoffman, 1997 recipient of the National Medal of Science.

## Evaluation/Assessment

The ASSSP has been included as an educational credit course through the Nuclear Engineering Dept at MIT, and is listed as course 22.903H. MIT students who participated in the FY99 ASSSP will receive course credit for the 22.903H class. Prof. Ken Czerwinski, Nuclear Engineering Department at MIT, is coordinating efforts that will enable his MIT students who have been ASSSP participants to be able to continue their research experience during the school year and will include frequent visits to LLNL to collaborate with the Seaborg Institute. This effort will provide a valuable and unique opportunity to involve graduate students in the latest actinide research. Projects of this nature will strengthen research and education opportunities. Professor Heino Nitsche is pursuing academic accrediting of the ASSSP with the University of California, Berkeley.

In summary, the ASSSP program is administered well and the participants and LLNL receive value for their participation in this DOE-DP sponsored program as described by LLNL management and student surveys. It is the goal of the ASSSP to expand the opportunity for education credits for their participation in the summer program at LLNL. The overall consensus of the ASSSP students was that it would be beneficial both to the program and the participants to have the ASSSP program extended in duration to allow more time for their scientific research.

## FY99 Accomplishments

### *Actinide Sciences Summer School Program*

- LLNL ASSSP has been included as an educational credit through the Nuclear Engineering Department at MIT and listed as course 22.903H.
- LLNL/ASSSP is a national program that accepted student applicants from across the country.
- Expanded length of program from six weeks in 1998 to eight weeks in 1999.
- Increased number of participants from eight in 1998 to 12 in 1999.
- Sixty percent of the chosen ASSSP students have attended the American Chemical Society (ACS) Radiochemistry Summer School. Original objectives were to achieve 30%.
- Established a student selection committee that consisted of professors from SJS, UCB, University of Tennessee, and LLNL scientific and administrative personnel.
- Lecture series continued to consist of pioneers/leaders in the field of actinide science from universities, which featured speakers Prof. Darleane Hoffman (UCB), 1997 recipient of the National Metal of Science and nominee for the 2000 ACS Priestley Medal; Prof. Heino Nitsche, LBNL and UCB; Prof. G. Choppin, Florida State University; Dr. D. Clark, Director of Seaborg Institute at LANL; and Prof. J. Peterson, University of Tennessee.
- MIT professor assisted with the student curriculum and mentoring of students during the beginning weeks of the program.
- Used Undergraduate Research Semester (URS) housing which resulted in savings of 230% for the program, compared to housing costs in FY98 even though the program had larger student participation in FY99. Part of the result showed in the average STEP DP03 cost per student, which was \$31.3K in FY98 and \$21.3K in FY99 or a reduction of 32%.



## **FY99 Accomplishments**

### ***Actinide Sciences Summer School (ASSSP)***

- ASSSP students attended LLNL laboratory EH&S training courses, such as glove box safety, to allow them to work in the labs on their research projects.
- Curriculum established with the assistance of the newly-formed ASSSP application steering committee and incorporated the book “Elements Beyond Uranium” by Glenn T. Seaborg and Walter D. Loveland. Also, courses on Actinide Chemistry and Actinide Environmental Chemistry were provided by Prof. J. Peterson, University of Tennessee, and Prof. R. Silva, San Jose State University
- Implemented a metric for evaluating students’ participation in this program via student and mentor questionnaires at the close of the program.

## **Publications and Presentations**

- Actinide Science Summer School Poster Presentations, August 5, 1999.
- “Selective Separation of Actinide Ions by Ligand-Modified Polyelectrolyte Enhanced Ultrafiltration,” B. Shepler, University of Tennessee, UCRL-MI-135655
- “Spectroscopic Studies of Plutonium (VI) in 1 M Perchloric Acid,” A. Boswell, Washington University, UCRL-MI-135656
- “Nondestructive Assay of Waste Drums Using A&PCT,” J. McNamara, Worcester State College, UCRL-MI-135659
- “Laser-Induced Breakdown Spectroscopy of Lanthanide Colloids,” S. Mihardja, MIT, UCRL-MI-135661
- “Investigation of Strontium-90 Detection Limits in Aqueous Samples Using Cerenkov Counting,” P. Wei, University of California, Davis, UCRL-MI-135662
- “High-Temperature Pu Solubility Experiments,” D. Schnepple, University of Hawaii, UCRL-MI-135663
- “Characterization of Uranyl Hydroxide Precipitate,” J. Grell, University of California, Berkeley, UCRL-MI-135665
- “Behavior of Neptunium,” C. Sherman, MIT, UCRL-MI-135666
- “99-Technetium Immobilization with Commercially Available Activated Carbons,” C. Gillaspie, Georgetown College, UCRL-MI-135667
- “Surface Analysis of Uranium Particles,” K. Noyes, MIT, UCRL-MI-135657
- “X-Ray Absorption Spectroscopy of Actinide Oxides,” B. Sebastian, University of Washington, UCRL-MI-135658
- “Preparation of a Radiochemically Pure <sup>173</sup>Lu Sample,” M. Weber, MIT, UCRL-MI-135660

All of the above have been reviewed by LLNL for unlimited public release on the Internet.

## **Media Coverage**

- “Students take their studies to the lab,” Tri-Valley Herald, July 19, 1999, [http://education.llnl.gov/news/jul\\_19\\_19\\_lsssp.html](http://education.llnl.gov/news/jul_19_19_lsssp.html)

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Briefing	1	Cyber Security	B151	Video Tapes
New Employee Orientation	1	Welcome to LLNL	B151	B. Williams, Education Office
Course Curriculum	1	ASSSP Course Description	B151	Professors Silva and Peterson
Safety Training	1	Radiological Workers Training (#HS-6010; #HS-6300); Contamination Control; General Employee Radiological (#HS-6001)	B151	LLNL Hazard Control Staff
Actinide Chemistry	1	Coursework	B151	Prof. Peterson
Tour	1	Visualization	B361	Jerry Friesen/Sandia
Glove Box Operations	1	Training	B151/Lab	Safety team
Environmental Chemistry	1	Coursework	B151	Prof. Silva
Seminar	1	Optical Spectroscopy	B151	Professors Silva and Peterson
Tour	1	KDP Crystal Growth	B1678	Natalia Zaitseva
Seminar	1	Accelerator Mass Spec.	B361	John Knezovich
Seminar	1	Iraq Inspections	B361	Jacqueline Kenneally
Seminar	1	Environmental Restoration	B361	Tina Carlsen
Briefing	1	Integrated Safety Management	Host Directorate	
Seminar	1	Earthquakes	B361	Erna Grasz
Lecture	1	Actinide Environmental Chemistry	B151	Dr. Robert Silva
Lecture	1	Actinide Chemistry	B151	Prof. Joe Peterson
Lecture	1	Atom-at-a-time Chemistry of the Transactinide Elements	B151	Prof. Darleane Hoffman
Lecture	1	U(VI) Solid Phase Chemistry - What can it tell us about spent nuclear fuel?	B151	Prof. Sue Clark
Lecture	1	The Fascination of Pu Science - The Most Chemically-Diverse Element	B151	Prof. Greg Choppin
Lecture	1	Variable Electron Counts and the Role of 5f/6d Electrons in Actinide Chemical Bonding	B151	Dr. David Clark
Lecture	1	Actinide Chemistry Needs for the New Millennium	B151	Prof. Heino Nitsche

## Optics and Lasers/National Ignition Facility

# Optical Society of America (OSA)/LLNL Student Chapter – Laser Science Summer School Program (LSSSP)

**STEP Contact:** Richard Farnsworth

**URLs:** <http://education.llnl.gov/lsssp/>  
<http://www.osa.org>

## Description

The Laser Science Summer School Program was conducted as part of the pilot Undergraduate Research Semester. (Refer to page 28.) Linking URS with professional scientific societies and their student chapters is part of the school-to-career theme of research internships. An Optical Society of America/LLNL student chapter will prepare advanced undergraduate students with U.S. citizenship to pursue careers in laser sciences, optics, and optical engineering in Department of Energy Defense Program projects at LLNL.

Students complete research projects with mentoring from Laser Science and Technology (LS&T) scientists and engineers. LS&T provides the students with specialized seminars each week, describing DOE-DP research related to stockpile stewardship and other defense-related research projects.

Students participating in LSSSP have the following deliverables:

- Make a symposium presentation to LS&T staff reporting research findings;
- Submit a written abstract describing the research; and
- Make a personal Web page describing their research experience to encourage more U.S. students to participate in future LSSSP internships and other DP-managed projects.

Students are encouraged to present their research at the Optical Society of America (OSA) annual conference and to submit a research paper for publication.

## Partners

Laboratory:

- Laser Science and Technology, Engineering

Non-Laboratory:

- Optical Society of America

## Goals, Objectives, and Metrics

- Increase the number of students pursuing graduate degrees in optics-related fields. Recruit students to seek employment at LLNL as laser and optics researchers and engineers. **Metric:** Track the number of STEP-LSSSP student interns who are offered employment at LLNL. Pre- and post-test students to assess growth in skill sets as defined by laser and optics research experts.



## Evaluation/Assessment

Before participating in the program, none of the five students had considered pursuing a Ph.D. in an optics-related field. After the program, four of the five were considering earning a Ph.D. Four of the five were evaluated as possible future employees at LLNL and would be invited back for additional internships to conduct graduate research. One of the five was listed on a patent resulting from his research. Mentors rated all five as having made greater contributions to the research projects than the cost of the time the mentors spent with each student. Four of the students made presentations at the OSA Annual Conference in September 1999.

## FY99 Accomplishments

### ***Optical Society of America/LLNL Student Chapter – Laser Science Summer School Program***

- LSSSP was conducted as a pilot URS summer program in FY99. Optical Society of America faculty members nominated their best students for LSSSP. Thirteen applications were received, from which five students were selected by LS&T and Engineering management.
- An OSA Student Chapter was formed to initiate students to participation as members of a professional society. This chapter provided a support network to help the students assimilate into the work routine. The president of OSA, Professor Anthony Seigman, visited the LLNL chapter to recognize the value of the LSSSP and to review the students' accomplishments.
- During the internship, each student was assigned a mentor having DP-funded research projects related to the student's interests. These students also participated in a weekly symposium highlighting DOE defense-related laser research at LLNL. Each student successfully completed a research project and made significant contributions to the overall research project.

## Publications and Presentations

- Four students made presentations at the OSA Annual Conference in September 1999.
- All five of the students presented at LLNL-sponsored research symposia.
- All five of the students submitted abstracts for their research Web page at <http://education.llnl.gov/lssp/>.

## Media Coverage

- “Rising Stars in Lasers,” Newslite, July 23, 1999
- “Laser Science Summer School Program,” Optics & Photonics News, June 1999, Vol. 10 No. 6, OSA Home Page

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Laser Safety and Security Classes	1	Training	Lasers Programs	Staff
Student Reception	1	Orientation	STEP	Howard Powell
LLNL Overview and National Security	1	Information	Lasers Programs	Don Correll
High-Brightness, High-Average Power Laser Design	1	Information	Lasers Programs	Luis Zapata
Ultrafast Lasers	1	Information	Lasers Programs	Surbrat Biswal
High-Average Power Diode-Pumped Solid State Laser Osc	1	Information	Lasers Programs	Eric Honea
Application of Nonlinear Optics	1	Information	Lasers Programs	Chris Ebberts
Careers in Lasers and Optics	1	Information	Lasers Programs	Careers in Lasers and Optics
Student Symposia	1	Research Presentation	Lasers Programs	Staff

## National Security Student Researchers

## Undergraduate Research Semester (URS)

**STEP Contact: Beverly Williams**

**URL:** <http://education.lanl.gov/resources/>

<http://education.lanl.gov/resources/urs/FourLabHomePage.html>

## Description

The Undergraduate Research Semester program provides unique and challenging off-campus research opportunities for upper-division university undergraduate students in science, mathematics, and engineering. This kind of research experience is not available at undergraduate institutions. This project is a partnership between Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Sandia National Laboratories (Albuquerque and Livermore). This collaborative program provides 85+ science and engineering undergraduates with a rich research experience. Laboratory scientists and students work together on significant research projects supporting the Defense Programs

## Description *continued*

mission. Technical staff (mentors) volunteer their time to guide individual undergraduate students of science, engineering and math through a 17-week research semester appointment. Auxiliary educational activities support the participants' technical background and broaden their perspective for future career decisions. The combination of individual scientific research guided by mentors and the supplementary educational activities structures the URS program as a dynamic opportunity for student participants and supports the immediate and future needs of the Defense Programs.

Additionally, the URS Program expands upon the valuable connection between the university community and the DOE laboratories. The program supports the traditional national goal to strengthen education and the quality of science, mathematics, and engineering.

The URS program places special emphasis on recruiting women and underrepresented minorities in science and engineering fields.

## Partners

### Laboratory:

- Computations
- Health and Ecological Assessment
- Proliferation Prevention & Arms Control
- Geosciences and Environment
- Earth and Environmental Sciences
- Geographical Information Science Center
- Physics Directorate – Physics and Space Technology
- Electronic Engineering
- Chemistry and Materials Science

### Non-Laboratory:

- Los Alamos National Laboratory
- Sandia National Laboratory, CA
- Sandia National Laboratory, NM
- ROTC Offices on College Campuses

## Goals, Objectives, and Metrics

- Develop a diverse workforce of individuals with enhanced problem solving and technical skills to enable the DP laboratories to meet current and future scientific and technological needs. **Metric:** Mentor evaluates the change in the student's knowledge and skills.
- Increase students' knowledge and skills in science, math, engineering, and technology topics and increase students' understanding of the research process. **Metric:** Mentor evaluates the change in the student's knowledge and skills. Conduct pre- and post-surveys; seek informal feedback from students; make observations; and review student products.
- Maintain the diversity of students who participate in national research programs at 20% - 30% underrepresented and 50% women. **Metric:** Annually track the number of underrepresented students and women participants.

## **Evaluation/Assessment**

- Evaluation tools provided coordinator and staff with information to ensure a quality undergraduate research experience.
- Tools used for evaluations were post-surveys, weekly student feedback sessions, site visits and observations, technical presentations, and a poster session display.
- Using student presentations and poster displays as tools enabled the student evaluators to determine if students had increased their understanding of the research process and research topics. The presentations and poster displays also provided an excellent opportunity to assess improved communication skills, which often correspond to increasing interest in science and self-confidence.

## **FY99 Accomplishments**

### ***Undergraduate Research Semester***

- Fiscal year 1999 marked the second year of the URS program. LLNL and SNL (CA) continued to successfully collaborate by combining our URS student enhancement activities. Each lab shared the costs of the enhancement activities and course work.
- In total, four of our outstanding spring and fall 1998 URS students participated in the 1999 National Conference on Undergraduate Research (NCUR) at the University of Rochester. Two students gave oral presentations and two participated in poster sessions.
- During the spring semester, one of our URS biology students participated in the 24<sup>th</sup> Annual West Coast Biology Undergraduate Research Conference at University of California, Irvine, giving poster presentation on the development of a functional chip for analysis of protein DNA interactions.
- The Tri-Lab URS coordinators held quarterly meetings to plan their recruiting strategy and strengthen the URS program.
- To increase the URS applicant pool, the Summer Employment Program included a URS flyer in all summer 1999 student-hire packets.
- URS students' Web pages were reviewed and released and are currently accessible on the Internet.
- During the academic school year, women participation showed a slight increase from FY98 – 50% to 56% percent. However, summer URS student participation was predominately male which decreased the annual female participation percentage. In addition, the underrepresented students from both minority and majority institutions increased from 45% to 50%.
- As a pilot project, URS was linked to MARA-ROTC and cadets/midshipmen were successfully recruited into URS internships.
- URS arranged a pilot summer internship program. There were six participants from various U.S. colleges/universities who became members of the Optical Society of America. In addition, there were three MARA/ROTC students from University of California, Berkeley; University of San Diego; and University of Washington. Several URS summer students are continuing to participate in the fall 1999 semester.
- The URS students' starting salaries were increased to be competitive with the Laboratory's Summer Employment Program and Sandia National Laboratory.

## **FY99 Accomplishments** *continued*

### ***Undergraduate Research Semester***

- Organized the first joint field trip to the Nevada Test Site (NTS) for the LLNL, Sandia-CA, and Sandia-New Mexico URS students. While visiting NTS and Yucca Mountain, the students viewed joint DP projects that were extraordinary examples of how the DP complex works together. The student feedback regarding the educational value of the field trip was very favorable.

## **Publications and Presentations**

- All URS students' final research papers are submitted to the LLNL Technical Information Department for review and release. Once reviewed, the Laboratory publishes the students' papers. In addition, several students have co-authored papers in their specific research departments.

## **Media Coverage**

- "Undergraduate Research Semester (URS) Students Finish Fall Session."
- "AHS grad at Livermore Lab," Fall 1998, students' hometown newspaper article.
- "Educating the next generation," CAMP Quarterly, Spring 1999.
- "Flipping burgers for science at nuclear lab," Tri-Valley Herald, August 1, 1999.

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Tours	8	<ul style="list-style-type: none"> <li>▪ SNL-CA and LLNL-Livermore Site 300</li> <li>▪ Special tour for visiting SNL-NM URS students</li> <li>▪ Tours for Summer URS, MARA and SNL-CA students</li> <li>▪ LANL and SNL-NM, symposium participant tours</li> </ul>	<ul style="list-style-type: none"> <li>▪ SNL-CA</li> <li>▪ LLNL-Livermore and SNL-CA</li> </ul>	<ul style="list-style-type: none"> <li>▪ Various LLNL and SNL employees</li> </ul>
Seminars	11	<ul style="list-style-type: none"> <li>▪ Enhancement Activity: student awareness of Lab-wide research opportunities available at LLNL, SNL</li> <li>▪ Enhancement activities for all LLNL/SNL-CA and Summer Employment Program students</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL</li> <li>▪ SNL-CA</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL, SNL employees</li> </ul>
Field Trips	7	<ul style="list-style-type: none"> <li>▪ Enhancement Activity: exposure to science and technology in the S.F. Bay Area</li> <li>▪ NTS: Joint Field Trip</li> </ul>	<ul style="list-style-type: none"> <li>▪ San Francisco Exploratorium</li> <li>▪ Lawrence Berkeley Lab</li> <li>▪ Monterey Bay Sanctuary</li> <li>▪ Stanford Linear Accelerator</li> <li>▪ LLNL – Site 300</li> <li>▪ San Jose Tech Museum</li> <li>▪ Nevada Test Site</li> <li>▪ Yucca Mt.</li> </ul>	<ul style="list-style-type: none"> <li>▪ S.F. Exploratorium</li> <li>▪ LBL employees</li> <li>▪ Monterey Bay docents; Dr. Weible</li> <li>▪ Stanford Univ. grad. students</li> <li>▪ LLNL employees</li> <li>▪ Self guided tour</li> <li>▪ NTS staff</li> <li>• Yucca Mt. staff</li> </ul>
Workshops	17	<ul style="list-style-type: none"> <li>▪ Enhancement Activity: skills necessary to meet student requirements:</li> <li>▪ Technology: Web Page Development (2)</li> <li>▪ Research Course (8)</li> <li>▪ Electronic Poster Development Class (2)</li> <li>▪ Design and Delivery Presentation Class (4)</li> <li>▪ Movers and Shakers - How to interview for a job! (1)</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL and SNL-CA employees</li> <li>▪ Consultant companies</li> </ul>

## Workshops and Events *continued*

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Events	10	<ul style="list-style-type: none"> <li>▪ Enhancement Activity Student/URS Requirements</li> <li>▪ Mentor URS Orientation</li> <li>▪ Student/Mentor Luncheon</li> <li>▪ Student URS Orientation</li> <li>▪ Poster Session</li> <li>▪ Student Symposium</li> <li>▪ Oral Presentations-Student/Mentor</li> <li>▪ Awards Breakfast</li> <li>▪ Second Annual DP Student Symposium</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL</li> <li>▪ SNL-CA</li> </ul>	<ul style="list-style-type: none"> <li>▪ LLNL and SNL-CA employees</li> <li>▪ URS Students</li> </ul>

## National Security Cooperative (NSC)

**STEP Contact: Barry Goldman**

**URL:** [http://education.llnl.gov/step\\_student.html](http://education.llnl.gov/step_student.html)

### Description

National Security Cooperative internships assist undergraduate and graduate students in science, mathematics, engineering, and technology (SMET) to complete their degree requirements and prepare for transition into scientific careers in support of the Defense Programs mission. NSC offers a unique blend of research experience and continuing education. Student interns work as members of research teams in fields of their interest, some of which earn credit for courses accredited by their universities which contribute to their degree requirements. Each intern is matched with a Laboratory scientist to work together on a significant research project supporting the Defense Programs mission. Laboratory technical staff acting as mentors volunteer their time to guide student work. As a result, interns demonstrate improved confidence in their ability to successfully apply academic knowledge in a research setting. Evaluation data show that student involvement in cutting-edge research and student relationship with a mentor are keys to favorably influencing undergraduate students in their pursuit of graduate studies and future careers in basic and applied research.

### Partners

Laboratory:

- LLNL DP Programs and Directorates



## Partners

### Non-Laboratory:

- Associated Western Universities (AWU)
- California Alliance for Minority Programs – UC system
- California Cooperative Education Association (CCEA)
- DOE Nuclear Fellowship Program
- Minority Undergraduate Research Participation in the Physical and Mathematical Sciences
- Teach for America
- University of California and California State University Campuses
- University of the Pacific (UOP)

## Goals, Objectives, and Metrics

- Attract students to DOE/DP areas of research. **Metric:** Evaluate the number of students involved, the support of the appropriate directorates, the number of recruited mentors.
- Raise student awareness of DOE/DP research and its contribution to society. **Metric:** Evaluate input from the student responses as judged by STEP personnel.
- Enhance the academic development of SMET students with hands-on activities. **Metric:** Evaluate input from the student responses as judged by the Institutional Education Committee.
- Promote teamwork skills as a method of solving complex problems. **Metric:** Analyze the quality of student responses to assessments and input from the mentors.
- Increase the number of underrepresented students entering SMET careers. **Metric:** Evaluate the number of underrepresented students participating.
- Promote students' confidence in their ability to successfully apply theory to solve real-life problems. **Metric:** Analyze the quality of the student responses as judged by their mentors.

## Evaluation/Assessment

Evaluation tools developed for the Undergraduate Research Semester Program have been modified for future use with NSCP participants to ensure a quality research experience. These tools include pre- and post-surveys, focus meetings with the participants and their mentors, and required end of assignment technical presentations. Participants will be encouraged to participate in the Defense Programs symposium and poster presentations. Using the student presentations and poster displays, evaluators can determine if students are increasing their understanding of the research process and the research topics. The presentations and poster displays also provide an excellent opportunity to assess improving communication skills.



## **FY99 Accomplishments**

### ***National Security Cooperative***

- Forty-eight students participated in the NSC program, 45 of whom were processed through the Associated Western Universities (AWU).
- Underrepresented participation in NSC was 20%. Typically 10% of the applicants are underrepresented. Furthermore, 58% of the NSC participants were women while 30% typically apply.
- The number of LLNL research scientists/mentors participating in the program has increased by almost 30% over FY98, with a 25% increase in the number of female mentors.
- The number of students participating in FY99 has increased by over 80%, with a 100% increase in the number of female students being placed.
- Ninety-three percent of the participants are fully funded by the department hosting the student and STEP facilitates the infrastructure.
- Three University of the Pacific (UOP) students are now participating in the Education in Industry Fellowship at LLNL.

## **Publications and Presentations**

- Experience Matters, California Cooperative Education Association, "A Business Partnership with Cooperative Education," Post-Conference Issue, June 1999.

## **Media Coverage**

- "Livermore lab aims young for computer scientists," Contra Costa/Tri-Valley Business Times, March 5, 1999, Vol. 1, No. 23,  
<http://education.llnl.gov/FY00proposals/proposals.html>
- "Lawrence Livermore Lab is neighborly teacher," The Modesto Bee, Tuesday, January 26, 1999.

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Cyber Security	1	Briefings	Hosting Directorate	Videotapes
Design and Delivery	1	Oral Delivery Workshop	B415	Mike Gennin
Adaptive Optics	1	Seminar	B361	Brian Bauman
Visualization	1	Tour	Sandia, B911	Jerry Friesen
KDP Crystal Growth	1	Tour	B1678	Natalia Zaitseva
Accelerator Mass Spec.	1	Tour	B361	John Knezovich
Biological Dosimetry	1	Seminar	B361	Joe Lucas
Scientific Writing	1	Research Papers and Abstracts Workshop	B415	Carol Hall
Research Process	1	Overview	B415	John Knezovich
Iraq Inspections	1	Seminar	B361	Jacqueline Kenneally
Environmental Restoration	1	Seminar	B361	Tina Carlsen
Integrated Safety Management	1	Briefings	Hosting Directorates	Claire Max and Don Correll
What is Applied Science	1	Seminar	B543	Jeff Wadsworth
NIF	1	Seminar	B543	Bill Hogan
Computer Modeling	1	Seminar	B543	Tomas Diaz de la Rubia
Earthquakes	1	Seminar	B361	Erna Grasz
Nova/NIF	1	Tour	B481	Tour guides

## HBCU/HSI/MI Research Collaborations Program

### HBCU/HSI/MI Research Collaborations Program (RCP)

**STEP Contact: Kennedy Reed**

**URL:** <http://www.llnl.gov/urp/HBCU/homepage.html>

### Description

The LLNL Research Collaborations Program for Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs) and other Minority Institutions (MIs), is a Laboratory-wide program which develops and promotes productive and mutually-beneficial scientific collaborations between LLNL and the nation's HBCUs and MIs. The collaborations link accomplished faculty and students from these institutions with LLNL principal

## Description *continued*

investigators in research which supports LLNL and DOE-DP programmatic missions.

The Research Collaborations Program builds upon the research capabilities which already exist at the schools, and enhances these capabilities through access to the unique facilities and expertise at LLNL. In doing this, the program also expands the schools' capacity for training students in the sciences and related disciplines.

In these collaborations professors and students participate in leading edge research in a wide variety of disciplines – such as nonlinear optics, atomic physics, materials science, spectroscopy, plasma diagnostics and massively parallel computing. They make presentations at national and international symposia and conferences, and they are frequently co-authors with LLNL principal investigators on publications stemming from the research. The participants also have the opportunity to expand their connections with the larger scientific community through interactions with scientists from other institutions who collaborate with LLNL.

The Research Collaborations Program provides opportunities for graduate students and undergraduate students to have significant and enriching research experiences at LLNL and on their home campuses. Faculty and student participants can come to LLNL during summer and semester breaks, but the cooperative research continues throughout the year – at the schools and at LLNL. In some cases, LLNL scientists have visited the schools to present seminars and help with the research on campus and, for some collaborations, the Research Collaborations Program has made equipment, computers and software available to support the research at the school.

The professors and students in this program have made important contributions to basic and applied research work at LLNL. Also, a significant number of the undergraduate participants have entered graduate programs in the physical sciences. A major goal of the program is to increase the number of minority students entering science and technology careers – particularly in disciplines which are important to LLNL and DOE Defense Programs.

## Partners

### Laboratory:

- LLNL National Security Directorates
- LLNL Materials Research Institute

### Non-Laboratory:

- HBCUs, including Alabama A&M University Howard University; Fisk University; Florida A&M University; Morehouse College; Prairie View A&M; Clark Atlanta University; and Spelman College
- Two HSIs: Florida International University; City College of New York
- NSF Centers of Research Excellence in Science and Technology at Alabama A&M and at Florida A&M; NSF Supported Center for Analysis of Structures and Interfaces at CCNY; ONR-supported program in physical science at Spelman College; NASA supported Photonics Center at Fisk
- UC, Davis; Auburn University; Sandia-CA
- DOE Office of Basic Energy Sciences

## Goals, Objectives, and Metrics

- Involve faculty and students from HBCUs/HSIs/MIs in collaborative research with LLNL in support of DOE-DP programmatic needs.
- Expand training capabilities of HBCUs/HSIs/MIs in areas important for DOE-DP by providing opportunities for faculty and students to work with LLNL facilities and LLNL scientists on projects relevant to LLNL programs and DP.
- Increase visibility of HBCUs/HSIs/MIs in nationally recognized scientific endeavors.
- Increase number of minority students entering careers in scientific fields relevant to LLNL and DP.
- The collaborations are linked with LLNL National Security Directorates and contribute to projects connected with the DP Stockpile Stewardship Management Program, including NIF and ASCI. The collaborations provide training for students from underrepresented Minority groups in research relevant to DP, and contribute to the DP goal of ensuring a highly trained and diverse workforce.
- **Metric:** Research results which contribute to LLNL/DP programs; number of publications; number of presentations at conferences and symposia; number of students from the program who pursue graduate studies or careers in Science and Technology disciplines.

## Evaluation/Assessment

The program has done well in terms of achieving its stated goal of involving faculty and students from HBCUs/HSIs/MIs in collaborative research with LLNL in support of DOE-DP programmatic needs. Some of the accomplishments listed below reflect how well this goal has been achieved. For example, the collaboration with City College of New York has had direct impact on the National Ignition Facility which is a major DOE-DP program. In each collaboration, students and faculty from the HBCUs/HSIs/MIs have worked with LLNL scientists. The publications and presentations listed below have included faculty and students from HBCUs/HSIs/MIs as co-authors and have thus helped increase the visibility of these schools in nationally-recognized scientific endeavors. The participating students have had practical training in particular scientific disciplines and have had practice in making presentations on their work. The value of these collaborations to LLNL is reflected in the following comments:

Steve Payne, associate program leader for Laser Technology Development at LLNL said, “The diffusion doping concept and expertise brought by the Fisk team was a very important contribution. For example, Cr-doped zinc selenide is beginning to catch on as a commercial laser material, and the commercial suppliers are using the Fisk concept. This has been a very good collaboration.”

Ming Yan, Project Scientist in Lasers and Optical Materials Group said, “Both sides have learned a lot from each other. City College discovered that the impurity level in the KDP crystals was the cause of the two-photon optical loss. This was very significant since it proved that the loss was extrinsic, which was unexpected, and that it could be eliminated or reduced by lowering the level of the offending impurities. LLNL has recently confirmed these results. The City College work may extend to two photon imaging, which would be a big step forward in pinning down optical damage mechanisms as well. The City College

## Evaluation/Assessment *continued*

results were very unique and it's a very good collaboration. We're writing several good publications as well."

Peter Beiersdorfer, group leader for EBIT Spectroscopy said, "The collaboration with Morehouse is going very well. We've been working together for about five years. Prof. Smith has been coming here in the summers and we've had five students from Morehouse. We've gotten wonderful output, many joint papers, and Morehouse now has its own program started with funding directly from DOE. It's expanding to include a post-doctoral student starting this summer with a half-time appointment at Morehouse and half-time at LLNL. This really works well because students come from Morehouse very well trained. It's a wonderful project, now starting to support itself. A very good collaboration, and mutually beneficial."

## FY99 Accomplishments

### ***HBCU/HSI/MI Research Collaborations Program***

- Collaborative project with City College of New York (on nonlinear optical absorption) demonstrated that impurities are major cause of two-photon optical loss in KDP laser materials. A CCNY student presented a seminar on this work to LLNL Lasers Optical Materials Group for NIF.
- Collaborative project with Alabama A&M on a Novel Temperature Diagnostic for High Explosives received an LDRD Feasibility Study Award.
- The Cr-doped Zinc Selenide developed in the LLNL-Fisk Collaboration is receiving attention as a commercial laser material, and the commercial suppliers are interested in using the Fisk concept.
- Our collaborative project involving Florida International University, UC Davis and LLNL received a UCDRD grant.
- The first observations and measurements of dissociative recombination of  $\text{He}^{2+}$  were accomplished in the collaboration with FIU International University. This work was reported at the Gordon Conference on Atomic Physics and at the Fourth International Conference on Dissociative Recombination, held in Stockholm, Sweden in June. Also, a manuscript on this work was submitted to Physical Review Letters and includes the FIU professor and an FIU student as co-authors.
- Students from three of the collaborations made presentations on their work at the 2<sup>nd</sup> DOE/DP Student Research Symposium held in July at LLNL.
- Student posters on work in collaborations received 1<sup>st</sup> Prize at DOE-EBSCOR Symposium in Baton Rouge, March 1- 4, and honorable mention at the U.S. DOE-FETC-HBCU Symposium in Miami, March 16-18, 1999.
- Sixteen presentations at seminars, symposia and conferences in FY99.
- Ten manuscripts published or submitted for publication in journals or conference proceedings in FY99.

## Publications and Presentations

### *Publications from HBCU/HSI/MI Collaborations in FY99*

- P. Beiersdorfer, G. V. Brown, M.-F. Gu, C. L. Harris, S. M. Kahn, S.-H. Kim, P. A. Neill, D. W. Savin, A. J. Smith, S. B. Utter, and K. L. Wong, "Recent Livermore Excitation and Dielectronic Recombination Measurements for Laboratory and Astrophysical Spectral Modeling," in the Proceedings of the Int. Seminar on Atomic Processes, Toki, Japan (NIFS Conf. Proc., Toki, Japan 1999) (in press).
- Peter Beiersdorfer, G. Brown, S. Utter, P. Neill, K. J. Reed, A. J. Smith and R. S. Thoe, "Polarization of K-Shell A-Ray Transitions of  $Ti^{19+}$  and  $Ti^{20+}$  excited by an Electron Beam," *Phys Rev A*, in press.
- M. H. Chen, K. J. Reed, D. S. Guo, and D. W. Savin, "Dielectronic Recombination For Boronlike Ions," *Phys. Rev. A* 58, 4539 (1998).
- L. Coman, M. Guna, L. Simons and K. Hardy, "The first measurements of rotational constants for  $He^{2+}$ ," submitted to *Physical Review Letters*, 1999.
- S. Ferri, A. Calisti, R. Stamm and B. Talin, R.W. Lee, and L. Klein, "Electronic broadening model for high-n Balmer line profiles," *Phys Rev E* 58, 6943 (1998).
- L. Godbert-Mouret, T. Meftah, A. Calisti, R. Stamm, B. Talin, M. Gigosos, V. Cardenoso, S. Alexiou, R. W. Lee, and L. Klein, "On the Accuracy of Stark Broadening Calculations for Ionic Emitters," *Phys. Rev Letters*, 81, 5568 (1998).
- C. Kumar, A. Batra, L. Klein, A. Batra, "Solar Cycle Variation of  $NO_2$  in the Thermosphere," *JGR (Space)* 104, 14893 (1999).
- Kevin Langry and B. Rambabu, "Ionic Optodes: Role in the Fiber Optic Chemical Sensor Technologies," *Journal of Chemical Technology and Biotechnology*, Vol 74- 8, 1-16, 1999.
- C. Mossé, A. Calisti, R. Stamm, B. Talin, R. Lee, and L. Klein, "Redistribution of Resonance Radiation in Hot Dense Plasmas," *Phys Rev A* (August 1, 1999).
- B. Ritchie and Charles Weatherford, "Quantum Classical Correspondence in Nonrelativistic Electrodynamics," accepted by *International Journal of Quantum Chemistry*.
- B. Ritchie and C. Weatherford, "Use of a Fast Fourier Transform (FFT) 3-D Time Dependent Schroedinger Equation Solver in Molecular Electronic Structure," *Int. J. of Quantum Chem.*, vol. 70, p627, 1998.
- N. Satyanarayana, Xie, and B. Rambabu, "Sol-Gel Synthesis and Characterization of  $Ag_2O$ -  $SiO_2$  system," *Materials Science and Engineering B, Advanced Solid State Materials and Technology* (accepted).
- A. J. Smith, P. Beiersdorfer, K. J. Reed, A. L. Osterheld, V. Decaux, K. Widmann, and M. Chen, "Ratios of  $n = 3 \rightarrow 1$  Intercombination to Resonance Line Intensities for Heliumlike ions with Intermediate Z-values," Submitted to *Phys. Rev. A* (July, 1999).
- E. Träbert, P. Beiersdorfer, G. V. Brown, A. J. Smith, and S. B. Utter, "Improved electron-beam ion-trap lifetime measurement of  $Ne^{8+}$  1s2s 3S1 level," *Phys. Rev. A* (in press).
- Gregory J. Wagner and Timothy J. Carrig, Ralph H. Page, Kathleen I. Schaffers, Jean-Oliver Ndap, Xiaoyan Ma, and Arnold Burger, "Continuous-wave broadly tunable  $Cr^{2+}$ :ZnSe Laser," *Optics Letters*, Vol. 24, No 1, p19, January, 1999.



## Publications and Presentations *continued*

### *Publications from HBCU/HSI/MI Collaborations in FY99 continued*

- A. D. Walser, A. Bouselhami, Ming Yan, and R. Dorsinville, "Nonlinear Optical Absorption and Refraction in Optical Crystals," Proceedings of SPIE Annual Meeting, Denver, CO, 1999.
- N. Woolsey, B. Hammel, C. Keane, C. Back, J. Moreno, J. Nash, A. Calisti, C. Mossé, R. Stamm, B. Talin, A. Asfaw, L. Klein, and R. Lee, "Competing Effects of Collisional Ionization, and Radiative Cooling in Inertially Confined Plasmas," Phys Rev E 57, 4650, 1998).

### *Seminars, Symposia, and Conference Presentations from HBCU/HSI/MI Collaborations in FY99*

- "Growth of Semi-organic and Organic crystals for Nonlinear and Infrared detecting devices," R.B. Lal, L. Salary, J.M. Chang, W.S. Wang, and M.D. Aggarwal, Invited talk, Presented at the Eleventh American Conference on Crystal Growth and Epitaxy, Loews Ventana Canyon Resort, Tucson, AZ, August 1-6, 1999.
- "High Temperature Solution Growth of CdSe:Cr<sub>2</sub><sup>+</sup> for Tunable Mid-IR Laser Application," J. -O. Ndap, S.U. Egarievwe, X. Ma, K. Chattopadhyay, Steven Morgan and A. Burger, Eleventh American Conference on Crystal Growth and Epitaxy, ACCGE-11, Tucson, AZ, August 1-6, 1999.
- "Recent Livermore Excitation and Dielectronic Recombination Measurements for Laboratory and Astrophysical Spectral Modeling," P. Beiersdorfer, G. V. Brown, M.-F. Gu, C. L. Harris, S. M. Kahn, S.-H. Kim, P. A. Neill, D. W. Savin, A. J. Smith, S. B. Utter, and K. L. Wong, Int. Seminar on Atomic Processes, Toki, Japan, July 29-30, 1999.
- "High Temperature Solution Growth of CdSe: Cr<sub>2</sub><sup>+</sup> for Tunable Mid-IR Laser Application," Kafrisha Morrow, 2<sup>nd</sup> Annual DOE/DP Student Research Symposium, Livermore, CA, July 29, 1999.
- "Nonlinear Optical Absorption and Refraction in KDP Crystals," Robinson Pino, 2<sup>nd</sup> Annual DOE/DP Student Research Symposium, Livermore, CA, July 29, 1999.
- "Solution Techniques for Wave Packets of the Time-Dependent Schroedinger Equation," Lonnie Mott, 2<sup>nd</sup> Annual DOE/DP Student Research Symposium, Livermore, CA, July 29, 1999.
- "Growth and Morphology of Nonlinear optical crystal 3-methoxy-4-hydroxy-benzaldehyde (MHBA)," Leroy Salary, R.B. Lal, W.S. Wang, M.D. Aggarwal, and B.G. Penn, Presented at the Conference on Operational Characteristics and Crystal Growth of NLO Materials, SPIE's 44th Annual Meeting and Exhibition, Denver, CO., July 18-23, 1999.
- "In-situ optical determination of thermomechanical properties of ZnSe and ZnTe crystals," A. Burger, J. -O. Ndap, K. Chattopadhyay, X. Ma, and E. Silberman, S. Feth, W. Palosz, and C.-H. Su, SPIE Annual meeting, Denver CO, July 18-23, 1999.
- "Dissociative Recombination in He<sub>2</sub><sup>+</sup>," K. Hardy, International Conference on Dissociative Recombination, Stockholm, Sweden, June 15-22, 1999.
- "Lawrence Livermore National Lab Research Collaborations Program For HBCUs and MIs," Kennedy Reed, presented at the Technology Transfer Sessions of the HBCU and OMI Annual Symposium, Sponsored by the U.S. Department of Energy Office of Fossil Energy, Miami, FL, March 17, 1999.



## Publications and Presentations *continued*

### *Seminars, Symposia, and Conference Presentations from HBCU/HSI/MI Collaborations in FY99*

- “A Study of the Pressure Dependence of the Yield of the Dissociative Recombination Reaction of  $\text{Ar}_2^+$  in Glow Discharges,” L. Simons, M. Guna and K. Hardy, APS Centennial Meeting, Atlanta, GA, March, 1999.
- “Sol Gel Synthesis and Performance Studies of Silver Silicate Gels,” Rhonda Johnson, Charles Wayne, Nallani and B. Rambabu, US. DOE-FET -HBCU symposium, March, 1999.
- “Dissociative Recombination,” Kenneth Hardy (from Florida International), presented at University of Georgia, Athens, GA, February 19, 1999.
- “High-efficiency, broadly tunable continuous-wave  $\text{Cr}^{2+}:\text{ZnSe}$  laser,” Gregory J. Wagner and Timothy J. Carrig, Richard H. Jarman, Ralph H. Page, Kathleen I. Schaffers, Jean-Oliver Ndap, Xiaoyan Ma, and Arnold Burger, Optical Society of America, Advanced Solid State Lasers, Boston, MA, Jan.31-Feb 3, 1999.
- “Properties of transition metal doped zinc-selenide materials for mid-IR Lasers,” Arnold Burger (from Fisk University), presented at Alabama A&M University, January 25, 1999.
- “Development of Solid State Tunable Mid-IR Lasers,” Ralph Page (from LLNL), seminar presented at Fisk University, January 12, 1999.
- “X-Ray Spectroscopy on an Electron Beam Ion Trap,” Augustine Smith (from Morehouse College), presented at the International Workshop on Spectroscopy and Applications, Dakar, Senegal, December 12, 1998.
- “Two-Photon Absorption in KDP Crystals,” Adil Bousselhami (undergraduate senior from CCNY), seminar presented at Lawrence Livermore National Lab, November 8, 1998.
- “Absorption and Photoluminescence Spectroscopy of  $\text{ZnSe}:\text{Cr}^{2+}$  Prepared by Diffusion Doping,” N. Giles, C. Rablau, J. -O. Ndap, X. Ma and A. Burger, II-VI Workshop, Charleston, SC, October 1998 .

## Media Coverage

- The Lawrence Livermore National Laboratory Research Collaborations Program for Historically Black Colleges and Minority Institutions was mentioned in a front page article in the April 1999 issue of the American Physical Society News.

## Defense Programs Tri-Lab Education

# Defense Programs Tri-Lab Education Exhibit

**STEP Contact:** *Stephen C. Sesko*

## Description

The Tri-Lab Education Exhibit project enables the DOE Defense Programs labs, under the initial leadership of LLNL, to display a presence in the eyes of major professional organizations, such as the National Science Teachers Association (NSTA); American Association for the Advancement of Science (AAAS); American Physical Society (APS), Institute of Electrical and Electronics Engineers (IEEE); and others. The project provides for exhibit space for a DP lab booth, for exhibitor workshops, presentations, roundtables, etc., in conjunction with the exhibit and also for personnel travel, shipping costs, and exhibit maintenance and upgrades.

## Partners

Laboratory:

- DP Science Education Program – Los Alamos National Laboratory
- DP Science Education Program – Sandia, New Mexico
- DP Science Education Program – Sandia, California
- DP Headquarters

## Goals, Objectives, and Metrics

- It is vital that the national laboratories become engaged with national professional organizations in order to further the dialogue on science and technology education. This exhibit is an opening statement in that dialogue. The objective of the project is to increase access to, and involvement with, DP laboratory personnel (scientists, technicians, etc.) through their education activities. This increased access will result from the exhibition given to these programs at major professional gatherings. **Metric:** Evaluate the number of conferences attended, the type of audience, the estimated number of contacts
- The project establishes a joint exhibit that represents not only LLNL, LANL, and both Sandia sites, but also represents DOE/DP. It highlights the involvement that we all have in science, mathematics, and technology education – involvement that is not well known outside of the local areas served by the labs. **Metric:** Evaluate the “buy-in,” participation, and contributions by all four labs; the types of materials provided, time in support, other “in-kind” participation.
- The project allows the beginning of collaborations with other organizations – not only those where the exhibit is displayed but also with those who may attend that event. **Metric:** Determine ways to measure this objective through discussion with the other labs. With one year’s experience, we now have information to use to address this objective. One example might be the number of new participants in Laboratory projects or the number of requests for materials as a result of the exhibit

## Goals, Objectives, and Metrics *continued*

being at a particular conference. Another possibility is that, because of the nature of the project, evaluation might be similar to that done for museum displays – enumerating the number of visitors and the number of questions asked.

## Evaluation/Assessment

- During the first year, the exhibit was used at one local conference, at one major DOE/DP event, and at a major national conference of science educators. At the latter event, it was estimated the exhibit was viewed by over 4,000 individuals representing K-12 and post-secondary faculty.
- STEP took the initiative to acquire the exhibit and the signage connected with it.
- STEP developed a tri-fold brochure to accompany the exhibit. This brochure will also be available for other uses within the DP education complex. At the national conference, LANL provided support on the opening afternoon, while Sandia New Mexico joined LLNL – STEP for the remaining three days of the conference.
- At the 1999 NSTA conference, STEP recruited one rural school to be a part of the Critical Issues Forum and Sandia, New Mexico, received numerous requests for its advanced manufacturing video tape.

## FY99 Accomplishments

### ***Defense Programs Tri-Lab Education Exhibit***

The versatility of the exhibit allowed it to be used in a number of different venues:

- Technical Women's Symposium meeting in California, October 1998.
- Accelerated Super Computing Initiative (ASCI) project inauguration at Northern Arizona University (NAU), January 1999.
- The National Science Teachers Association (NSTA) conference in Boston, March 1999.
- STEP designed and produced a tri-fold brochure to go with the exhibit. This brochure was used at a special conference held at the White House.

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Technical Women's Symposium	1	Networking	San Ramon, CA	LLNL staff
ASCI at NAU	1	ASCI Pipeline Dedication	NAU, Flagstaff, AZ	DOE/IBM/ University of Utah
NSTA Conference	1	National gathering of over 15,000 science educators	Boston, MA	S. Sesko, LLNL; D. Foley Wilson, SNL-NM

## Section 2 – Education Technology, Teacher Enhancement, and Curriculum Improvement (Pre-College)

### Introduction

As a science and technology national laboratory, Lawrence Livermore National Laboratory has always been committed to advancing technology within its mission-based science. Likewise, the use of technology to support our science education activities is a major goal of STEP.

STEP supports pre-college teacher enhancement and curriculum improvement in science and technology to impact the overall “pipeline” issue. Our projects in support of this goal emphasize creative thinking and problem-solving skills necessary for a successful undergraduate education in science, mathematics, engineering, and technology majors. These projects include, among other activities, workshops in which the direct participants (high school teachers or students) are introduced to scientific research methods that support the particular objective(s) of the project.

### *Education Technology*

## Technology Resource Center (TRC/Tower)

**STEP Contact:** *Richard Farnsworth*

**URL:** <http://hangar.llnl.gov>

### Description

The Technology Resource Center is a Web server (<http://hangar.llnl.gov>) and computer facility that allows our partners in the education community to communicate with us and to reach out to the vast resources on the Internet. In addition to technology workshops, we provide access to electronic lesson and curriculum materials centered on the Laboratory and Defense Programs, such as the Atmospheric Release Advisory Capability (ARAC). We believe that technology will serve as the gateway to the future both economically and socially. It is crucial, therefore, that both teachers and students be technically literate and understand the use of the Internet in research that supports Defense Programs. This can be accomplished through hands-on training and placing Laboratory technology in the hands of students and teachers.

### Partners

Laboratory:

- LLNL Computations Directorate
- California Technology Assistance Project

## Goals, Objectives, and Metrics

- Contribute to the integration of educational technology at the school, district and county level; contribute to the school-wide emphasis on the use of technology as a tool to support authentic learning; increase use of the Internet as a research tool for teachers and students; develop student knowledge and hands-on experiences with technology; prepare teachers to use technology in their instruction. **Metric:** Feedback surveys provided from administrators and teachers who participated in the Tower workshops.

## Evaluation/Assessment

The Tower FY99 workshops were evaluated through information derived from feedback from participants. These educators rated the workshops as an outstanding asset to their professional development. The California Technology Assistance Project (CTAP) also known as the Digital High School Project, recognizes the Tower Resource Center as an asset to be used as a component in this state-wide project.

## FY99 Accomplishments

### *Technology Resource Center*

- Presented 45 technology workshops to over 800 teacher workshop participants.
- Presented and assisted in more than 40 school in-service workshops or laboratory training workshops.
- Continued updating the mathematics, science, and elementary resources databases. Average 5-10 new sites added every week and constant screening for broken resources.
- Offered to participants in the California Technology Assistance Project as a resource to help these schools provide in-service instruction to faculty. CTAP and the TRC/Tower both have the goal of preparing teachers to use computer technology as a tool to support integrated instruction. (CTAP Web site: <http://www.ctap.org>.)
- Increased the access control of computer lab machines to the Lab's internal network.
- Upgraded the cloning software in the Harbor computer lab to aid in computer lab management.

## Media Coverage

The TRC/Tower Web site has been linked to from a variety of educational Web sites throughout the Internet. We have also presented at a variety of educational technology conferences within California (e.g., San Joaquin, Alameda, and Contra Costa County Offices of Education educational conferences).

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
Workshops	85	Technology and In-service Workshops	Tower/Harbor computer labs	Brian Lindow, Kristin Faulkner, Eric Thiel, and Mike Shackelford

*Teacher Enhancement and Curriculum Improvement*

## **Critical Issues Forum (CIF) on Nonproliferation, Arms Control, and International Security**

**STEP Contact: Stephen Sesko**

**URL:** [http://education.llnl.gov/critical\\_issues/](http://education.llnl.gov/critical_issues/)

### **Description**

The Critical Issues Forum is designed to involve high school students and teachers in issues of proliferation and control of weapons of mass destruction (WMD), particularly nuclear weapons. Current CIF modules include: a) proliferation, nonproliferation, and counter proliferation; b) the disposition of nuclear materials; and c) terrorism and WMD. In addition to the DP-oriented content, CIF provides students with instruction and guidance in research methodologies, including brainstorming, evaluation of content, synthesis of information, and writing. We emphasize strategies that can be used with the Internet. LLNL-STEP involves scientists and other professionals from within the LLNL complex. CIF is collaborative. LLNL-STEP, working with the Center For Nonproliferation Studies at the Monterey Institute of International Studies (MIIS) and with faculty from the Naval Postgraduate School (NPS), leads the project in California, Idaho, Oregon, Washington, Texas, and we are looking to expand to other locales. The LANL Science Education Team (SET) leads the project in New Mexico.

### **Partners**

#### **Laboratory:**

- Science Education Team - Los Alamos National Laboratory; Lawrence Livermore National Laboratory - Nonproliferation Arms Control and International Security Directorate
- LLNL Center for Global Security Research (CGSR)

#### **Non-Laboratory:**

- Center for Nonproliferation Studies – Monterey Institute of International Studies (MIIS)
- Faculty of the Naval Postgraduate School (NPS)
- Joel E. Ferris High School – Spokane, WA
- Lewis and Clark High School – Spokane, WA
- Thurston High School – Springfield, OR
- Acalanes High School – Lafayette, CA
- California High School – San Ramon, CA
- San Leandro High School – San Leandro, CA
- Sierra High School – Manteca, CA
- Monterey High School – Monterey, CA
- The York School – Monterey, CA
- Eastern Idaho Technical College – Idaho Falls, ID
- Ballard High School – Seattle, WA
- Sterling High School – Sterling City, TX



## Goals, Objectives, and Metrics

- Provide a large number and variety of opportunities for students and teachers to develop and apply critical thinking and problem solving skills to a complex problem of DP, national, and global significance. **Metric:** Evaluate the number of students and teachers involved, both continuing and new; the number of workshops and conferences provided; the number of contacts with mentors.
- Demonstrate the multiple perspectives involved in these issues; e.g., scientific, economic, political, cultural, and geo-political. **Metric:** Evaluate the quality of the student responses as judged by MIIS, NPS, LLNL, and STEP personnel in addition to the professional opinions of their teachers; student written materials will be reviewed and compared against the literature for accuracy, style and other content measures by the personnel mentioned.
- Increase access to and involvement with Laboratory personnel. **Metric:** Evaluate the support of the appropriate directorates; the number of recruited mentors, interactions with mentors, presentations given by scientists to students and teachers.
- Increase public understanding of the issues relating to the future of the nuclear world. **Metric:** Evaluate the quality of the student responses as judged by MIIS, NPS, LLNL, and STEP personnel and their teachers (see above); attendance by the public at conferences and other meetings; sessions held at the participating schools.
- Model collaboration between large national institutions and state educational communities. **Metric:** Review the acceptance of presentations at juried conferences; papers at conferences; publications.
- Allow teachers and students to develop the connections between scientific concepts and everyday life. **Metric:** Analyze the quality of the student responses as judged by MIIS, NPS, LLNL, and STEP personnel (see above).
- Increase opportunities to develop greater public understanding of the Defense Program National Laboratory missions by interrelating and leveraging DP Laboratory programs. **Metric:** Evaluate the number of students and teachers involved; track the number of participants who indicate interest in pursuing these topics as a career choice; track the number of students placed in internships and other DOE offerings.

## Evaluation/Assessment

- LANL has had the CIF project evaluated by the Center for the Study of Evaluation (CSE) at the Graduate School of Education and Information Studies at the University of California, Los Angeles. LANL is also undertaking other evaluative studies that focus on a particular area of the project; e.g., use of technology.
- In addition to these pedagogical evaluations, LLNL is having all of its contributions to the CIF project subject to a complete review and release process within the Laboratory.
- Based on our metrics, the formative evaluation of CIF FY99 is mixed. Objectives one and seven were clearly met based on the four-fold increase in participation by both teachers and students. Objectives two, four and six were met, in our opinion due to the high quality of the student work. We met objective five through our juried presentations. We were very weak in meeting objective three, mentoring. This will be one of the challenges for FY00.



## **FY99 Accomplishments**

### ***Critical Issues Forum on Nonproliferation, Arms Control, and International Security***

- STEP worked with Dr. Clay Bowen and Dr. Amy Sands from the Monterey Institute of International Studies to develop the West Coast implementation of CIF.
- STEP recruited Dr. James Wirtz of the Naval Postgraduate School as a guest lecturer for the project.
- STEP recruited five new schools for the FY99 topic; MIIS recruited two new schools; one from FY98 continued the project. This was a four-fold (two to eight) increase in schools and the number of participating students.
- STEP presented CIF at one national and two regional conferences.
- As a result of the regional conferences and the national NSTA conference, STEP has gained interest from six possible new sites for the FY00 project. These sites are in Idaho, the Seattle area, Portland, OR, Las Vegas, NV, and West Texas.
- An extensive series of teacher conferences was held in Monterey, CA, in December, with Drs. C. Bowen, F. Wehling of MIIS, and Dr. J. Wirtz from the Naval Postgraduate School as guest speakers.
- An extensive series of student conferences was held in Spokane, WA; Eugene, OR; LLNL; and Monterey, CA, with Mr. G Kampani and Dr. C. Bowen from MIIS, and Dr. J. Wirtz from NPS as guest speakers.
- Three Washington State students and their teacher, one California student and his teacher attended the 1999 student conference held in New Mexico, an increase over the one team STEP sponsored in FY98.
- The STEP PI is engaged in ongoing discussions with MIIS and NPS about the future involvement of other institutions and additional funding sources, particularly to support their participation with LLNL.
- STEP sponsored a student from the United States Naval Academy as a Military Academic Research Associate (MARA) intern during the summer of 1999.
- Three high school teachers, faculty from MIIS and NPS, the STEP PI, and the MARA intern participated in a week-long planning workshop held during the summer of 1999.
- STEP and MIIS began the task of developing a separate identity for the West Coast contribution to CIF.

## **Publications and Presentations**

- Sesko, S.C. (1999). "Beyond Building Web Sites: Critical Thinking On the Web." [Abstract] Proceedings of the Northwest Council for Computer Education.
- Sesko, S.C. (1998). "A Meeting of Minds: Real Thinking Over the Net." [Abstract] Proceedings of the Fall CUE Conference.
- Sesko, S. C. (1999). "Web Research on Real Issues: Critical Thinking and Technology . . . Really!" [Abstract] Proceedings of the National Educational Computing Conference.

## Media Coverage

- “Teen View of Nuclear Issues,” San Jose Mercury, March 30, 1999.
- “Thurston students study nuclear threat,” The Springfield News, January 13, 1999.
- “Lab lecture for teens focuses on Russia,” Tri-Valley Herald, February 2, 1999.
- “Vergino goes ‘back to USSR’ to help reduce WMD,” Newsline, February 5, 1999.

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
CIF Kick-off Teacher Workshop	1	Acquaint teachers with the program. Introduce the Web site, expectations, and requirements. Introduce the pedagogical concepts and the research methodologies. Introduce DP content.	MIIS	LLNL STEP: S. Sesko; MIIS: C. Bowen, F. Wehling, G. Kampani; NPS: J. Wirtz
Student Workshops	4	Acquaint students with the project.	Spokane, WA; Eugene, OR; LLNL; MIIS	LLNL STEP: S. Sesko; MIIS: C. Bowen
Student Conference	1	Allow student participants to demonstrate the knowledge they have gained through CIF.	LANL	LANL keynote speaker
Planning Workshop	1	Develop benchmarks and related materials for the following year.	MIIS	LLNL STEP: S. Sesko, J. Dolby; MIIS: C. Bowen, F. Wehling, G. Kampani

## Section 3 – Science Literacy and Education Outreach

### Introduction

STEP leads the Laboratory's education efforts in Science Literacy and Educational Outreach. These outreach efforts are designed to address requests from both the education community as well as the public. Program audiences encompass everyone from students, parents, and teachers to organizations and businesses. Through our activities, we showcase and raise the public's awareness of the Laboratory's research and development efforts in science, engineering and technology.

Many of these efforts depend primarily on volunteers throughout the Laboratory who are supported by their management. The Science & Technology Education Program staff provides additional integration and liaison support. In classrooms and at special events and workshops, volunteers conduct presentations, demonstrations, and discussions centered on Laboratory expertise and core competencies in science and technology. They invite audience participation through hands-on activities and through stimulating discussion about the concepts being presented.

The STEP staff maintains an extensive collection of newspaper articles published in LLNL *Newsline* and various local newspapers about Science Literacy and Education Outreach activities. A listing of approximately 55 articles, published during fiscal year 1999, is offered at the end of this section under the heading "Media Coverage" (page 57).

## Classroom Speakers Bureau

*STEP Contact: Linda Dibble*

### Description

When the Laboratory receives requests related to science education outreach endeavors, they are forwarded to the Science and Technology Education Program. The Program maintains a database of employees and their related areas of expertise who have volunteered to provide presentations and speak to audiences upon request. The majority of these requests are for speakers in a classroom or in a school audience environment for special events such as career days. They also include science fair judges and one-day, job-shadowing opportunities.

### FY99 Accomplishments

#### ***Classroom Speakers Bureau***

- One LLNL employee received the Director's Office Special Recognition Award for his volunteer efforts and dedication to this program.
- STEP responded to 25 requests for volunteers to represent the Laboratory at school and community events.
- There were 2,765 participants involved in or attending these events. This number represents a broad spectrum of ethnic backgrounds.

## **Expanding Your Horizons (EYH)**

**STEP Contact: Linda Dibble**

### **Description**

The Expanding Your Horizons program provides an informal science experience for young women, traditionally underrepresented in the sciences, and encourages them to pursue careers in science and technology. EYH depends on volunteers who are enthusiastic role models, offers hands-on activities, and promotes the importance of science, mathematics, engineering and technology. Two of the three annual conferences are conducted in areas that have a large population of underrepresented students and a heavy emphasis is placed on encouraging their participation.

### **FY99 Accomplishments**

#### ***Expanding Your Horizons***

- In April 1999, 600 young women and 55 adults attended the Tri-Valley Conference at the Pacific Bell facility in San Ramon, California.
- In March 1999, 464 young women and 61 adults attended the Mills College Conference in Oakland, California.
- In October 1999, 382 young women and 28 adults attended the San Joaquin Conference at the University of the Pacific in Stockton, California.

## **Explorer Post**

**STEP Contact: Linda Dibble**

### **Description**

The Science and Technology Explorer Post 957 is under the “career awareness” auspices of the Boy Scouts of America. The Post is “chartered” by STEP/LLNL. Members consist of college preparatory high school students who work on “projects” such as Web-page development, Excel spreadsheet applications, and fiber optics demos. Some LLNL volunteers act as advisors to the students on these projects while others provide training, project demos and tours for the Explorers. The goal of the program is to encourage the members to stay focused on pursuing a college education by providing opportunities for students to work on projects related to their areas of study and interest. They learn how to work in a team environment, conduct official club meetings, and interact with adults as advisors and mentors.

## FY99 Accomplishments

### *Explorer Post*

- The Women's Business Council of San Francisco awarded the president of the post, a young woman, \$500 for her service to "Women in Exploring."
- The treasurer of the Explorer Post, a young man, was awarded \$10,000 in a national science competition for his invention of an electro-optic, color-matching system for use by the visually color-impaired.
- Membership increased to 41 high school students in FY98/99 with an additional 30 students from one high school, Newark Memorial High.

## Fun with Science (FWS)

*STEP Contact: Linda Dibble*

### Description

Informal, hands-on science experiences for students, teachers, parents, and public groups are offered through the Fun With Science program. Activities are conducted by a number of volunteers from various disciplines within the Laboratory. These activities seek to encourage and motivate students' interest in the sciences. This program addresses requests from educators and the public for science-related presentations in the classroom and at community events. It introduces the participants to how science and technology play a significant role in their lives. Presentations are centered on Laboratory expertise in areas such as Lasers, Energy, and Chemistry.

## FY99 Accomplishments

### *Fun with Science*

- One LLNL employee received the Director's Office Special Recognition Award for his volunteer efforts and dedication to this program.
- A total of 4,971 K-12th grade students and 1,192 adults participated in the FWS presentations this year.
- The FWS volunteers visited 66 schools and/or community events located throughout the state of California and Nevada.
- For a second year, FWS participated in a special science Olympiad in Kings County, which is heavily populated by children of seasonal farmer workers from the California Central Valley.
- The third annual FWS fair on the lawn was held in August and about 400 Laboratory employees and their families attended this noon-time event.

## Future Scientists and Engineers of America (FSEA)

*STEP Contact: Don Correll*

### Description

STEP has partnered with the Future Scientists and Engineers of America, a national, non-profit organization based in Southern California. FSEA provides the structure, project material, documentation and workshop training necessary to establish after-school science clubs in K-12 schools. STEP's program is structured around LLNL scientists mentoring a classroom of students (grades 4 through 12) on hands-on FSEA science projects. STEP worked with four schools this past year to continue ongoing clubs or implement new ones.

### FY99 Accomplishments

#### *Future Scientists and Engineers of America*

- Two new schools, one in Tracy, CA, and one in Pleasanton, CA, implemented the program in the fall of 1998. There were a total of 55 students who participated.
- The American Indian Charter School in Oakland, CA, continued as an official club. There are 25 students in this club.
- A combined elementary and middle school in Manteca, CA, continued as an official club as well. There are 25 students in this club.

## Math Challenge

*STEP Contact: Don Correll*

### Description

Math Challenge is an annual competition co-sponsored by the Department of Energy Oakland Operations Office and the LLNL Science and Technology Education Program, which provides enrichment materials, scientific mentors, and judges. Schools from throughout Northern California enter up to five teams, with three students each, who participate in this competition. This year's competition consisted of a traditional math challenge with 12 questions and a short demonstration on puzzles and perceptions.

### FY99 Accomplishments

#### *Math Challenge*

- During FY99, STEP continued to support a National Education Goal by sponsoring the 10<sup>th</sup> annual Math Challenge on May 8, 1999. Approximately 50 high school students from eight Bay Area schools participated.

## FY99 Accomplishments *continued*

### ***Math Challenge*** *continued*

- In addition to the traditional math challenge questions, students were presented a short demonstration on “Puzzles and Perceptions” that focused on unique ways of looking at puzzles for easy solutions. An hour of “Puzzle Fest” followed in which students solved 10 puzzles and received source information for the puzzles.

## Partnerships/Collaboration Efforts

**STEP Contact:** *Linda Dibble*

### Description

Educational Partnerships and Collaborations represents STEP’s efforts to address the requests, both by the education community as well as the public, for LLNL partnerships, collaborations, committee representation, and presentations. Through committee memberships we engage fellow members and participants in a better understanding of the programs offered through STEP and strengthen our relationships with the community at large.

## FY99 Accomplishments

### ***Partnerships/Collaboration Efforts***

- STEP formed a partnership with California Cooperative Education Association (CCEA) and the Associated Western Universities (AWU). STEP currently houses the executive director of this partnership called the Co-op Connection. A STEP manager is currently the president of CCEA through June 2000.
- STEP established collaboration with San Ramon Valley Unified School District to export the rapid growth KDP crystal technology, developed for the LLNL National Ignition Facility, from the laboratory to the classroom.
- STEP established a collaboration with the Optical Society of America (OSA) to bring promising undergraduate students to the LLNL Laser Programs for a research internship. OSA used its network of faculty at colleges and universities throughout the United States to identify the five best students who conducted research at LLNL this summer.
- STEP has established collaboration with the University of California, Merced to help improve the science and technology instruction provided to students throughout the San Joaquin Valley.
- Through their collaboration efforts, STEP was the recipient of various awards: Outstanding Cooperative Employer from CCEA, Friend of Education Award and Golden Apple Award from Tracy Rural Educators Association, and Silver Level Partner Recognition from Pleasanton Partnerships in Education Foundation.



## Science on Saturday (SOS)

**STEP Contact: Don Correll**

### Description

STEP held their third annual Science on Saturday lecture series – a seven-week series of free 90-minute lectures geared toward middle- and high-school students, their teachers, parents, and chaperons. The lectures covered a wide range of topics from the forefront of science and technology research in a variety of disciplines. The goal is to allow students to interact with well-known scientists and engineers in the hopes of increasing the numbers who pursue careers in science and technology. These presentations are co-sponsored by Science and Technology Education Program and Sigma Xi.

### FY99 Accomplishments

#### ***Science on Saturday***

- Seven presentations were offered in FY99. The topics ranged from science in the Soviet Union to using adaptive optics for earth-based telescopes that can see as never before.
- A total of 1700 students, parents, and teachers attended the FY99 series.

## Tri-Valley Science and Engineering Fair (TVSEF)

**STEP Contact: Don Correll**

### Description

The Tri-Valley Science and Engineering Fair is a science competition for local middle- and high-school students. Students are offered opportunities to develop original scientific experiments under the guidance and mentorship of teachers, scientists and engineers from local businesses. There are 13 scientific, engineering, mathematical or computer-related categories that students can select from to compete. Projects are judged on creativity, scientific thought/engineering goals, thoroughness, skill and clarity. The judging standards are established by the Intel International Science and Engineering Fair. The Tri-Valley Fair, an affiliate of the Intel Fair, provides recognition to the students for their achievements through exposure and awards. The Tri-Valley Fair's four sponsors are the LLNL, Blackhawk Automotive Museum, Tri-Valley Business Council, and the Contra Costa newspapers.

### FY99 Accomplishments

#### ***Tri-Valley Science and Engineering Fair***

- A total of 225 students participated in the FY99 Tri-Valley Science and Engineering Fair.
- Two students who were first-place winners at this year's event also won fourth place and \$500 at the Intel International Science and Engineering Fair. They competed against 150 teams from 47 countries.

## Science Literacy and Education Outreach

### Media Coverage

- “Science anyone? Horizons works to get more girls interested,” The Stockton Record, October 4, 1998 (EYH)
- “Future Tense,” The Oakland Tribune, October 22, 1998 (FWS)
- “Expanding math and science horizons,” Sandia Lab News, October 23, 1998 (EYH)
- “Oakland hosts fourth annual DOE Day,” DOE This Month, November 1998 (FWS)
- “Saturday science back in session,” Newsline, January 22, 1999 (SOS)
- “Science classes over the hill,” The Modesto Bee, January 26, 1999 (FWS & SOS)
- “Learning beats cartoons in ‘Science on Saturdays’,” The Tri-Valley Herald, January 26, 1999
- “Applications due for Tri-Valley science fair,” The Valley Times, January 30, 1999 (TVSEF)
- “Annual science fair in need of judges,” Newsline, January 29, 1999 (TVSEF)
- “Science on Saturday series kicks off,” Newsline article, January 29, 1999
- “3<sup>rd</sup> Annual Tri-Valley Science & Engineering Fair – Calling all Whiz Kids!” The Valley Times, February 1, 1999
- “Students still have time to apply for science fair,” The Tri-Valley Herald, January 2, 1999 (TVSEF)
- “Explaining genome project,” The Valley Times, February 2, 1999 (SOS)
- “Lab lecture for teens focuses on Russia,” The Tri-Valley Herald, February 4, 1999 (SOS)
- “Vergino goes ‘back to USSR’ to help reduce WMD,” Newsline, February 5, 1999 (SOS)
- “Take virtual tour of Lab at Science on Saturday,” The Herald, February 18, 1999 (SOS)
- “Volunteers are needed for Tri-Valley EYH event,” Newsline, February 19, 1999 (EYH)
- “Saturday talk offers a virtual reality check,” Newsline, February 19, 1999 (SOS)
- “Saturday talk to reveal science of the perfect swing,” Newsline, February 26, 1999 (SOS)
- “On deck, the science of the swing,” The Valley Times, February 27, 1999 (SOS)
- “Scientist puts physics to bat,” The Sunday Times (Contra Costa), February 28, 1999 (SOS)
- “Physicist helps players get into the swing,” The Tri-Valley Herald, February 28, 1999 (SOS)
- “Scientist puts physics to bat,” The Valley Times, February 28, 1999 (SOS)
- “Science on Saturday,” The Tri-Valley Herald, March 4, 1999 (SOS)
- “Expanding Horizons,” The Independent, March 4, 1999 (EYH)
- “Students get opportunity to expand their horizons in math, science,” Newsline, March 5, 1999 (EYH)
- “Saturday talk focuses on NIF’s computer controls,” Newsline, March 5, 1999 (SOS)
- “Lab series to discuss world’s largest laser,” The Valley Times, March 5, 1999 (SOS)
- “Conference shows girls math, science careers,” The Valley Times, March 7, 1999 (EYH)
- “3<sup>rd</sup> Annual Tri-Valley Science & Engineering Fair,” The Valley Times, March 8, 1999 (TVSEF)
- “Shared Minds,” The Tri-Valley Herald, March 9, 1999 (EYH)
- “Shooting stars – with camera – focus of talk,” The Tri-Valley Herald, March 11, 1999 (SOS)
- “Expanding their minds and horizons,” Newsline, March 12, 1999 (EYH)

## Science Literacy and Education Outreach

### Media Coverage *continued*

- “Tri-Valley Science & Engineering Fair gets under way this week,” Newsline, March 12, 1999 (TVSEF)
- “Earth-bound telescopes with a view,” Newsline, March 12, 1999 (SOS)
- “Science & Engineering Fair,” The Independent , March 18, 1999 (TVSEF)
- “Science fair a challenge to curiosity,” The Valley Times, March 18, 1999 (TVSEF)
- “Student projects on display at Tri-Valley Science and Engineering Fair,” Newsline, March 19, 1999 (TVSEF)
- “Three Amador High seniors take top science fair prizes,” The Tri-Valley Herald, March 21, 1999 (TVSEF)
- “Science ‘wiz’ visits library,” The Stockton Record, March 21, 1999 (FWS)
- “Students show their flair for science fare,” Newsline, March 26, 1999 (TVSEF)
- “Retirees as a resource for employees” Newsline, March 26, 1999 (TVSEF, FWS, EYH and FSEA)
- “Plant study blossoms into fair victory,” The Valley Times, March 28, 1999 (TVSEF)
- “Obituaries: Dennis Chakedis,” The Tri-Valley Herald, April 12, 1999 (FWS)
- “Chakedis remembered for outreach efforts,” Newsline, April 16, 1999 (FWS)
- “Pleasanton students take 4<sup>th</sup> at Intel fair,” The Valley Times, May 8, 1999 (TVSEF)
- “Tri-Valley science winners among top finishers at Intel’s international fair,” Newsline, May 14, 1999 (TVSEF)
- “Math puzzles challenge Bay Area students,” Newsline, May 14, 1999 (Math Challenge)
- “DOE–LLNL 10<sup>th</sup> Annual Math Challenge Competition,” DOE This Month, June 1999 (Math Challenge)
- “3<sup>rd</sup> Annual Fun With Science Fair,” Newsline, August 20, 1999 (FWS)
- “Science students’ hair-raising experience,” Newsline, August 26, 1999 (FWS)
- “Attraction at the lab,” The Times, August 26, 1999 (FWS)
- “A future in science,” Newsline, August 27, 1999 (TVSEF)
- “Fun With Science,” Newsline, August 27, 1999 (FWS)
- “Volunteers needed to lead after-school science clubs,” Newsline, September 17, 1999 (FSEA)

## Section 4 – State of California and University of California Education Initiatives

### Introduction

This section describes two initiatives that were begun in FY99 to assist the University of California (UC) with its pre-college, science education activities within the State of California, especially in technology areas based in the Laboratory's science. The school-to-career initiatives – Crystals in the Classroom, and Laser Science and Optics in the Classroom – involved numerous partners from various education institutions that provided either funding or in-kind service to support the two initiatives:

- University of California, Merced
- Center for Advanced Research and Technology (CART)
- Fresno Unified School District
- Merced Unified School District
- San Ramon Unified School District
- Los Angeles Unified School District
- Pleasanton Unified School District
- San Jose State University
- Diablo Valley Community College
- San Francisco Exploratorium
- San Jose Technology Museum

Crystals in the Classroom and Laser Science and Optics in the Classroom will help provide more inquiry-based, hands-on science activities that support the State of California's new Science Framework built around the new California science standards. The accomplishments from the Crystals in the Classroom initiative were reported in the scientific meeting of the Optical Society of America in September 1999 and will be reported in the scientific meeting of the American Chemical Society in March 2000.

### Crystals in the Classroom (CIC)

**URL:** <http://education.llnl.gov/crystals/>

### Description

The purpose of the Crystals in the Classroom project is to coordinate the dissemination of rapid-growth crystal technology, developed from Inertial Confinement Fusion/National Ignition Facility (ICF/NIF) research, for use in high-school and community-college classrooms in the Livermore Tri-Valley area and San Joaquin Valley. Residents of these communities have an immediate impact on the public perception of LLNL and the DP-funded research performed here.

## Description *continued*

This crystal project provides teachers with science technology not available elsewhere. The project creates unique teaching tools and curricular materials consistent with the National Science Standards for science education. It meets these standards by making science instruction relevant to the student, allowing the student to apply the scientific concepts to solve problems. The teacher can determine the student's use of proper lab skills and the application of chemistry in the students' projects. Knowing how these crystals are used in NIF makes the instruction relevant, promoting interest in chemistry and developing a better understanding of the purpose and importance of NIF to national security.

The San Ramon Unified School District in cooperation with ICF/NIF and STEP funded the development of the crystal growth technology and curricular materials. The district supported a high school teacher as an intern in the LLNL Crystal laboratory for six weeks. During that time she learned to grow crystals and, with LLNL engineers, created a prototype crystallizer for the classroom. STEP staff, supported by University of California Directed Research Dollars (UCDRD) and LLNL General and Administrative (G&A) funds, coordinated the project. ICF researchers mentored the teacher and helped design the equipment. This teacher will conduct in-service workshops to train other high school and community college teachers to grow crystals and to build crystallizers. The crystallizer will grow a crystal weighing 2-3 pounds and 5cm on each side in three days. The districts of those teachers participating will purchase the materials to build their crystallizers as a part of the workshop.

STEP coordinates the dissemination of this technology among the high school districts and colleges and develops partnerships to provide broader dissemination. The Optical Society of America and the American Chemical Society have contributed to this goal by inviting these teachers to their annual conferences and asking them to make presentations to other educators during the CIC workshop.

## Partners

### Laboratory:

- Inertial Confinement Fusion/National Ignition Facility Program (ICF/NIF)

### Non-Laboratory:

- San Ramon School District
- Diablo Valley Community College
- Optical Society of America
- University of California, Merced
- Center for Advanced Research and Development (CART)

## Goals, Objectives, and Metrics

- Improve high school chemistry instruction with hands-on applications. Increase the number of teachers and students who are aware of the relevant technologies in national security and Stockpile Stewardship through their use of the CIC technology.  
**Metric:** Pre- and post-survey of teachers and students to determine changes in awareness of the importance of the relevant technologies to the Defense Programs mission.

## Evaluation/Assessment

The San Ramon School District, CART, and the UC, Merced Education Collaboration participants have agreed to evaluate the impact of CIC technology on student learning in chemistry using standardized tests and comparisons with the national science education standards. STEP will survey teachers on their understanding of the role of NIF and its relationship to national security.

## FY99 Accomplishments

### *Crystals in the Classroom*

- This is a new project. In FY99, however, the San Ramon Unified School District funded a teacher to optimize the crystal growth technology and to develop a crystal growth chamber suitable for classroom use. The teacher has been successful in optimizing the protocols, has created a teachers' guide to crystal growth, and will begin growing crystals in the classroom in September 1999.
- The STEP/University of California, Merced education collaboration has agreed to hold crystal growing workshops in the San Joaquin Valley for the three high school districts and two community colleges currently a part of this partnership.
- A Diablo Valley Community College chemistry professor working with a San Ramon District teacher has committed to incorporate CIC in his program and to provide for teacher training.

## Publications and Presentations

- Crystals in the Classroom was presented to teacher members at the annual conferences of the Optical Society of America and American Chemical Society in September 1999.

## Media Coverage

- "Lab helps formulate lesson plan," Tri-Valley Herald, May 25, 1999
- "Crystal-clear presentation," Newslite, May 28, 1999



## Laser Science and Optics in the Classroom (LSOC)

### Description

Laser Science and Optics in the Classroom initiates a school-to-career path, leading to careers in laser science and optics. It creates a high school science and mathematics curriculum and provides an equipment kit to help students develop their knowledge and interest in laser science and optics. The LSOC Web site connects students, parents and teachers to the entrance requirements at undergraduate and graduate laser and optics programs, provides virtual tours of LLNL laser laboratories with introductions to the men and women who perform the work, and links them to employment opportunities.

LSOC was started in FY98 as a collaboration with San Jose State University to adopt a laser project developed with National Science Foundation funding. The Exploratorium joined STEP to create an Internet curriculum and a career information system. STEP conducted two pilot in-service workshops and began disseminating lessons via the Internet. Los Angeles, Fresno, Contra Costa, and Alameda counties participated in the instruction.

LSOC activities in FY99 were further supported through a University of California Directed Research Development grant.

### Partners

#### Laboratory:

- Laser Science and Technology

#### Non-Laboratory:

- University of California, Merced
- Center for Advanced Research and Technology (CART)
- Fresno Unified School District
- Merced Unified School District
- San Ramon Unified School District
- Los Angeles Unified School District
- Pleasanton Unified School District
- San Jose State University
- San Francisco Exploratorium
- San Jose Tech Museum

### Goals, Objectives, and Metrics

- Increase the number of students aware of laser science and optics career opportunities. Integrate laser and optics technology into high science and math instruction. Prepare teachers to use lasers and optics technology as instruction tools. Provide students with career information regarding laser science education and careers. **Metric:** Collaborate with school counselors to monitor the impact of LSOC on student career and college choices.



## Evaluation/Assessment

Staff from the Center for Advanced Research and Technology in Fresno, CA, and the San Ramon Unified School District have agreed to evaluate the impact of instruction on student learning using standardized tests and national standards. They will also monitor career choices.

## FY99 Accomplishments

### ***Laser Science and Optics in the Classroom***

- LSOC was awarded a University of California Directed Research Development (UCDRD) grant to develop an education collaboration with the University of California Merced. This collaboration adopted the LSOC curriculum and, along with the participating school districts, funded three workshops.
- Based upon this UC Merced collaboration, Merced City College began updating its physics curriculum adding courses in optics with a long-term plan to offer a certificate program for laser electro-optics.
- Merced City College and CART will fund faculty internships at LLNL to develop skills in optics.
- During FY99, the Optical Society of America (OSA) adopted the LSOC program for teacher outreach.
- LSOC workshops are continuing to be offered throughout the Los Angeles School District. Teachers in all of the districts are effectively using the LSOC materials in their classrooms.

## Workshops and Events

Event Name	No. of Events	Event Purpose	Location(s)	Speaker(s)
LSOC	1	Teacher In-service	Merced	Gareth Williams
LSOC	1	Demonstration	Merced	Gareth Williams
LSOC Holograms	1	Teacher In-service	Los Angeles	Gareth Williams
LSOC	1	Demonstration	Clovis	Gareth Williams

## Appendix 1

### FY99 Participants and Demographics

#### Introduction

The Science and Technology Education Program at LLNL collects demographic data in two broad categories: Student and Faculty Programs, funded by DOE/DP, and Educational Outreach Programs, funded by LLNL G&A.

Within each category we collect direct<sup>1</sup> participant data for pre-college, undergraduate, and graduate participants and, where appropriate, indirect<sup>2</sup> participation.

The following table reflects the programs that are in each category:

Student and Faculty Projects DOE-DP Funds	Educational Outreach Projects LLNL G&A Funds
ASCI Jr. Capstone Research	Classroom Speakers Bureau
ASCI Pipeline - Northern Arizona University	Expanding Your Horizons (EYH)
ASCI Pipeline - California State University, Hayward	Explorer Post
ASCI Educational Simulations and Visualization	Fun with Science (FWS)
Military Academic Research Associates (MARA)	Future Scientists and Engineers of America (FSEA)
Actinide Sciences Summer School Program (ASSSP)	Math Challenge
Undergraduate Research Semester (URS)	Partnerships/Collaboration Efforts
National Security Cooperative Program (NSC)	Science on Saturday (SOS)
HBCU/HSI/MI Research Collaboration Program	Tri-Valley Science and Engineering Fair (TVSEF)
Defense Programs Tri-Lab Education Exhibit (Data discussed separately)	
Technology Resource Center (TRC/Tower) (Data discussed separately)	
Critical Issues Forum (CIF)	

Typically, DOE-DP funded projects are based inside the national security scientific programs within the Laboratory. The majority of them are directed at college participants.

In FY99, only one program, the Critical Issues Forum, was directed at pre-college participants.<sup>3</sup>

Two Web-based computing projects, ASCI Educational Simulations and Visualization and the Technology Resource Center, were used by participants from elementary school up to and including the community college level.

The former is a Web site on which demographics are not collected. The Technology Resource Center project is unique and will be profiled at the end of this appendix.

For similar reasons, the DP Tri-Lab Education Exhibit reports only numbers based on the attendance at the NSTA conference, which does not profile by ethnicity.

<sup>1</sup> K-12 teachers are included within the direct pre-college.

<sup>2</sup> Indirect pre-college participants are calculated using the following multipliers: primary (K-3rd) = 20, elementary (4th-5th) = 30, middle school = 125, and high school = 150. California State Department of Education statistics are used in calculating the indirect pre-college demographics.

(<http://www.cde.ca.gov/ftpbranch/sbsdiv/demographics/Demohome.html>)

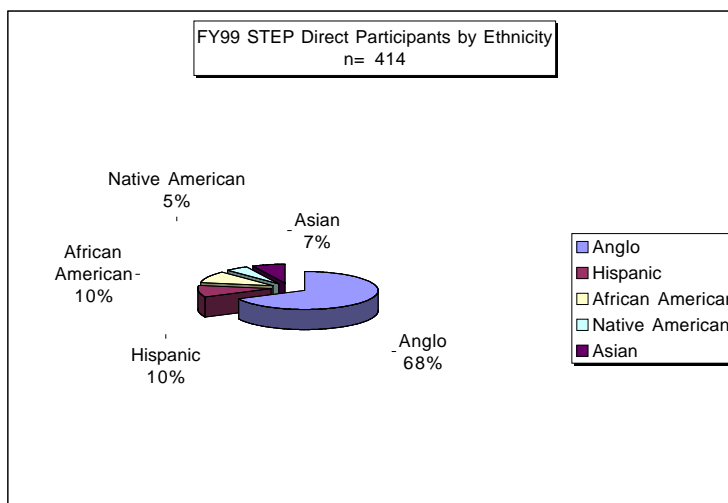
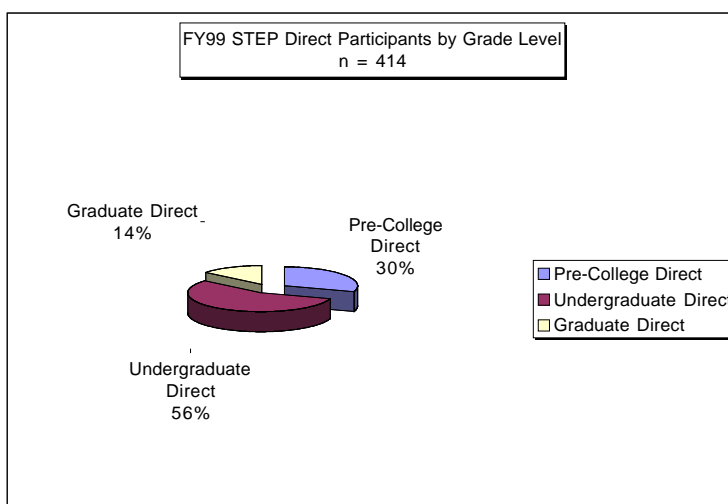
<sup>3</sup> All participants in CIF are classified as "direct" because the students and teachers work together on an equal footing.

## Student and Faculty Programs

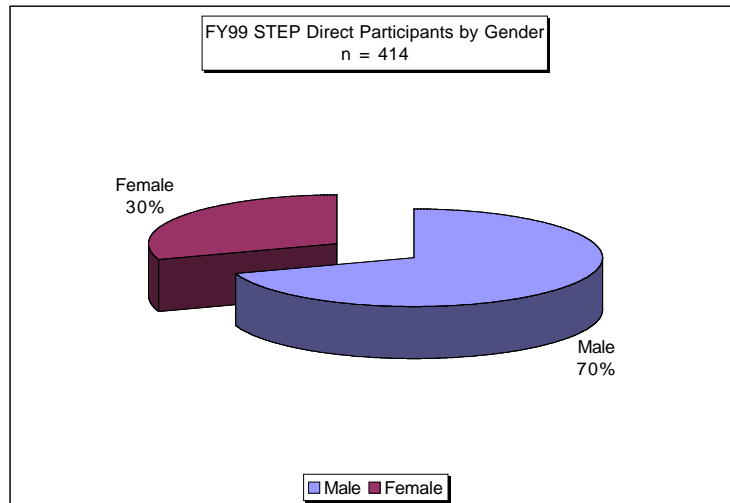
Following are total participant data for the student and faculty programs without the Technology Resource Center.

	Pre-college	Undergraduate	Graduate
Male	71	189*	29
Female	53	44	28
Total	124	233	57

The makeup of the student and faculty participation is shown in these graphs:



\* ASCI Jr. Capstone, as a course at Northern Arizona University, reflected a larger number of male participants (107 males versus 13 females) than the historical proportion of 50%.



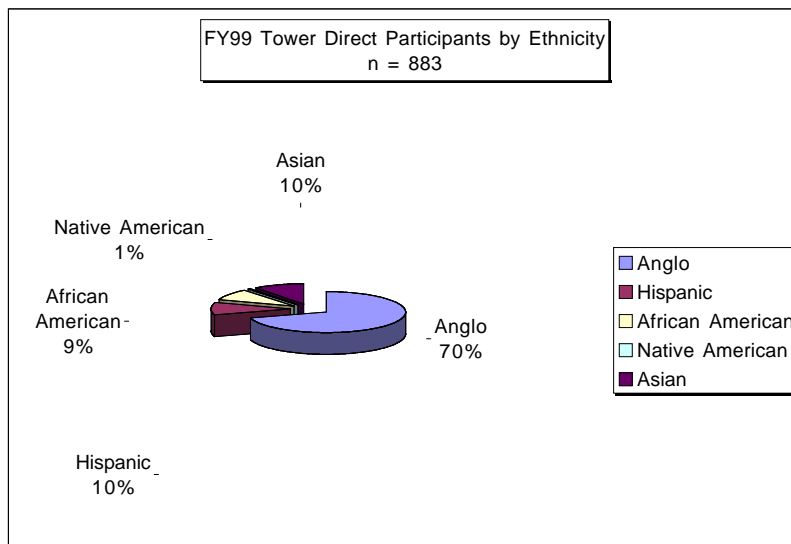
## Technology Resource Center and Tri-Lab Education Exhibit

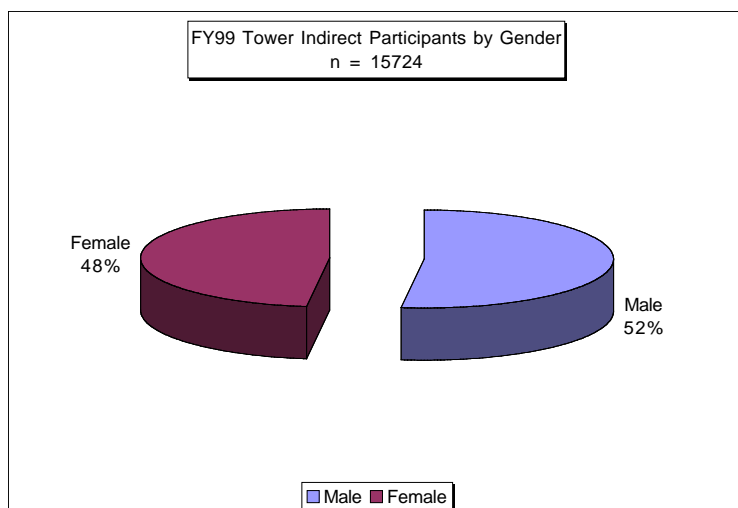
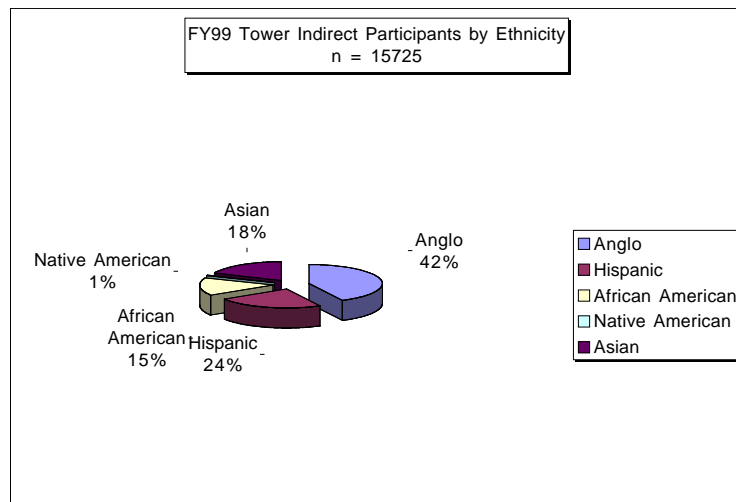
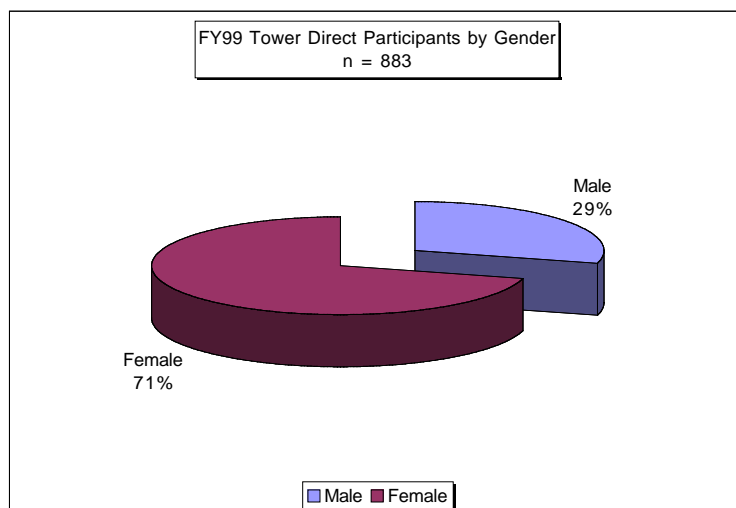
The Technology Resource Center program (TRC/Tower) is unique in that, while it is a DP-funded program, it fits the one-day event description that characterizes most of the Educational Outreach programs. TRC instructors have helped teachers who work under extremely tight schedules to explore the Internet for material that can be used to enhance science education instruction, along with an introduction to the web-based material that supports the Laboratory's national security mission.

Following are total participant data for the TRC Program:

	Direct Participation	Indirect Participation
Male	257	8,164
Female	626	7,580
Total	883	15,744

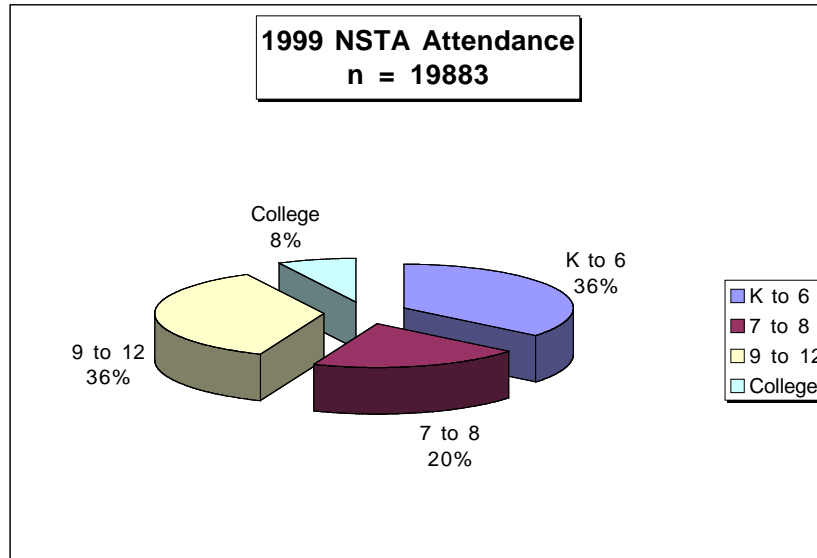
The profile of the Technology Resource Center participation is shown in these graphs:





## Science and Technology Education Program FY99 Participants and Demographics

The DP Tri-Lab Education Exhibit was designed as a vehicle to showcase DP-education activities at meetings of professional societies. In FY 99, our primary display was at the National Science Teachers Association convention in Boston. We distributed nearly 4,000 brochures during the four days of the meetings. Below is a breakdown of the attendance at the conference.

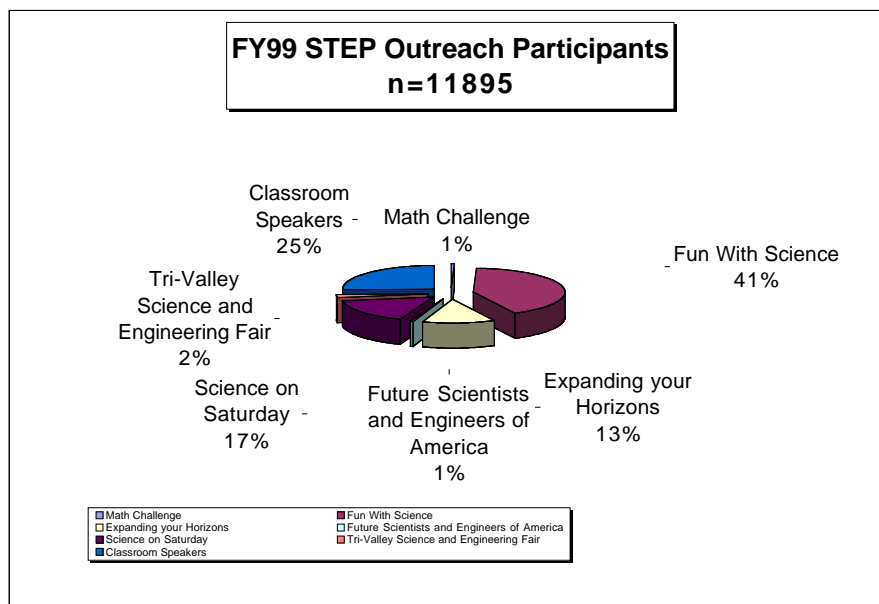


## Educational Outreach Programs

Among the Educational Outreach Programs, most are directed at middle- and high-school students. They are usually one-day events, though some like Science on Saturday run in a seven-week series. Our Explorer Post meets weekly for a set period of time. Fun With Science is primarily directed at elementary school participants.

Typically, the Educational Outreach Programs are funded through LLNL funds.

The following chart shows the breakdown of participation by program:



## Appendix 2

### Reprints of STEP Initiatives Articles

*CCEA Experience Matters, June 1999*



#### **A Business Partnership with Cooperative Education**

**Barry Goldman**

**Lawrence Livermore National Laboratory**

**Science & Technology Education Program Internship Opportunities**

Technically, LLNL is a premiere applied-science national security laboratory. Established in 1952 to help ensure national security through the design, development, and stewardship of nuclear weapons, LLNL made major advances in nuclear weapons safety and performances throughout the Cold War. To address national security needs, the Laboratory pioneered the application of technologies ranging from high-performance computers to advanced lasers and it gained multi-program responsibilities that drew on the Laboratory's multidisciplinary expertise. Today, LLNL's primary mission is to help ensure that the nation's nuclear weapons remain safe, secure, and reliable and to prevent the spread and use of nuclear weapons worldwide. This mission enables Livermore's programs in advanced defense technologies, energy, environment, bio-sciences, and basic science to apply LLNL's unique capabilities, and to enhance the competencies needed for the Laboratory's national security mission. LLNL serves as a resource to U.S. government and as a partner with industry and academia.

Educationally, LLNL has been involved in internships since the fall of 1992 with a program called Science & Engineering Research Semester (SERS). SERS no longer exists but has been re-engineered as the Undergraduate Research Semester (URS) and exists at LLNL and its sister labs, Sandia National Laboratories (located in Livermore, California and Albuquerque, New Mexico) and Los Alamos National Laboratory in Las Alamos, New Mexico. URS is a fall or spring internship, allowing participants to gain hands-on experience in a state-of-the-art research facility. More than half of the participants combine their experience with a summer term with some becoming recipients of graduate fellowships as a result of their LLNL experience.

In addition to the experience, students participate in seminars (some with lab tours), local field trips, present a poster and oral presentation and write a research paper with abstract. In preparation for these requirements, the students participate in classes for design



## ***CCEA Experience Matters, June 1999, continued*** ***A Business Partnership with Cooperative Education***

and delivery, poster preparation, scientific writing, and a research process course. Although the immersion in research is highly valued, so is the educational component to help the student become a better researcher.

Since 1992, the Science & Technology Education Program or STEP runs a number of other programs which support the Department of Energy's interest to increase the awareness of students to future careers. These programs are funded by the Department of Energy, Office of Defense Programs, Science Education. Another such program is the Actinide Science Summer School Program (ASSSP). This is an eight week internship during the summer for students interested in the actinide sciences. Still another initiative is a pilot with Northern Arizona University and expanding to include California State University, Hayward. This program seeks to acquire the participation of undergraduate and graduate students (with a focus on Native Americans and other under represented groups) and women in the emergence of the new scientific methodology of high performance computer-based modeling and simulation, the development of Internet technologies associated with simulation such as visualization, and the experimentation with distance learning and telecommuting technologies such as collaboration or tele-presence tools. This is being accomplished through a capstone program and summer internships called the Accelerated Strategic Computing Initiative (ASCI) Pipe Program.

As a national security laboratory, LLNL continues to seek ways to strengthen the relationship between the Laboratory and the Department of Defense. A recent educational initiative, the Military Academic Research Associates (MARA) program, is a step in this direction. The program is currently focussed on cadets and midshipman from the United States Military, Naval, and Air Force Academies and is presently being expanded to include the Coast Guard Academy and the Reserve Officer Training Corps (ROTC). We have designed the program to provide science-oriented, work-study internship opportunities for the participating students. Projects focus on national security issues and include such areas as stockpile stewardship, counterproliferation, advanced manufacturing, space operations, and laser technologies.

Our Research Collaborations Program was initiated in 1994 as an outgrowth of an effort to foster productive and mutually beneficial technical interactions between the Laboratory and the nation's Historically Black Colleges and Universities (HBCUs). This initiative has since expanded to include Hispanic Serving (HIS) and Minority Institutions (MI). The goal of the Research Collaborations Program (RCP) is to establish scientific collaborations between accomplished research faculty at HBCU's/HIS's/MI's and Principal Investigators at LLNL, in areas of LLNL Core Competencies.

In summary, why is LLNL - STEP as actively involved in internships and with the CCEA today versus any time in the past? The answer is in LLNL's mission of national security and need to increase the awareness of undergraduate students of Defense Program future careers. In the case of MARA and the Defense Program ROTC internships, which has a different objective, let me quote our Assistant Associate Director for Military Affairs, "the MARA/ROTC program is enormously successful. Today's cadets and midshipmen are the

***CCEA Experience Matters, June 1999, continued***  
***A Business Partnership with Cooperative Education***

next generation of leaders for their respective services. What they learn here will help shape their future ability to understand the broader defense capabilities of the - including those which reside at Lawrence Livermore National Laboratory."

For more information on STEP's internship programs, feel free to access the following URL's:

- Undergraduate Research Semester <http://education.llnl.gov/urs/>
- Actinide Science Summer School Program <http://education.llnl.gov/asp/>
- Military Academic Research Associates <http://education.llnl.gov/mara/>
- Research Collaborations Program for Historically Black Colleges and Universities, Hispanic Serving and Minority Institutions <http://www.llnl.gov/urp/HBCU/homepage.html>
- LLNL Science & Technology Education Program Web Page <http://education.llnl.gov/>
- LLNL Education Directory <http://education.llnl.gov/student/>
- LLNL Web Page <http://www.llnl.gov/>

Additional information on:

- Summer Employment Program <http://www.llnl.gov/llnl/02summer/SEP.html>
- Undergraduate Summer Institute <http://www.llnl.gov/usi/>

Graduate Programs:

- LLNL Postdoctoral Fellowship Program <http://www.llnl.gov/urp/LLNLPostDoc/LLNLPostDoc.htm>
- LLNL/UC Davis Graduate Fellowship <http://www.llnl.gov/urp/Sefellowship/sefellow.home.html>
- National Physical Science Consortium <http://www.llnl.gov/urp/NPSC/NPSC.html>

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48. UCRL-JC-134395

*CAMP Quarterly, Spring 1999*

## **Science Education in the National Interest**

by Donald L. Correll, Jr.

Director, Science & Technology Education Program  
Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory's commitment to science education finds its roots in the close relationship between Livermore Laboratory and the University of California, and in the realization that the leading edge research conducted at the Lab requires the development of skills that are not always readily available from academia. One of my goals when I became Director of the Science & Technology Education Program in May 1998 was to expand our education activities to help ensure a highly skilled, diverse laboratory workforce. This goal is being accomplished in part by engaging students as research interns in the Lab's mission-based, science programs with access to our state-of-the-art facilities.

It has also become apparent that the decline in students enrolling in undergraduatemajors of interest to Livermore Lab, such as physics, requires additional components be added to our education activities. As reported by American Institute of Physics (AP Enrollments and Degrees Report, January 1998), with respect to U.S. students, the number of B.S. degrees in physics has declined for the past seven years, leading to a 17% reduction. The negative slope in the number of degrees is not anticipated to change over the next few years.

Thus a decision was made to increase career counseling by researchers in our existing internships. A new education-research-counseling theme (see Figure 1) was developed for our science education projects involving pre-college, undergraduate, and graduate students, with an emphasis on undergraduates attending four-year colleges and universities. The "road-map" of figure 1 attempts to help students answer the question "what is the path that must be chosen to enter a challenging and rewarding career within science, mathematics, engineering, and technology disciplines?" Certainly the skills and training a research intern acquires are common factors to success in undergraduate curricula, graduate school, and technical careers.

Our experience at Livermore Lab mirrors that of our education and research colleagues at other institutions – career counseling combined with internships effectively increases the number of

students entering scientific careers. Being involved in world-class research provides interns with a set of experiences that support their education and career goals. At the same time, it is a proven method for attracting students to the Lab's mission-based science and technology. We offer numerous internships to undergraduate and graduate students that provide opportunities to become part of a professional team. The Undergraduate Research Semester (URS) is one of our programs with all of the above education research-counseling components. The URS is available at each of the three Department of Energy, Defense Programs National Laboratories: Lawrence Livermore, Los Alamos, and Sandia. Interns work with



*Dr. Don Correll*

mentors or scientific teams engaged in long-range, multi-discipline investigations. Appointments are usually for one semester or 17 weeks during the academic year. Students participate in seminars, workshops, and coursework designed to supplement the research experience and to help them address their questions about technical careers. Selection is based on academic references and merit, career goals, and availability. Research opportunities are available in such mission-based topics as electro-optics, large-scale computing and environmental protection. Figure 2 shows three former Livermore Lab URS interns, from top to bottom: Thomas Hall, Edgar Harding, and Anabel Miranda.

Hall worked in the operations engineering group of the National Ignition Facility laser construction project at Livermore Lab. He presently is working as an employee in the optics assembly areas of that facility. He will attend graduate school in fall 1999 working on a M.S. in robotics/controls.

Harding did research on earthquakes and the San Francisco Bay Bridge. He recently earned a B.S. in civil engineering at Mississippi State University. His internship at Livermore Lab connected him with a UC Berkeley professor who offered an opportunity

## CAMP Quarterly, Spring 1999, continued

for graduate research.

Miranda worked on the effects of bacteria to the overall corrosion rates of waste packages that could potentially be deposited for long-term storage at Yucca Mountain, Nevada. She has accepted another internship at the Lab while waiting to start graduate school in fall 1999 for doctoral studies in immunology and genetics.

These students are a recent representative sample of the 132 URS interns that spent a semester of their undergraduate education at Livermore Lab, 1995 through 1998. Of these interns, 30% pursued graduate school, 50% returned as summer employees, and more than 5% became career lab employees.

The banner for Livermore Lab's Web home page ([www.llnl.gov](http://www.llnl.gov)) reads "Science in the National Interest," which succinctly describes how the Lab's research is focused on issues of national importance. The Science & Technology Education Program's activities are described on our home page ([education.llnl.gov](http://education.llnl.gov)) under a parallel banner "Science Education in the National Interest." If students can be part of the Lab's scientific inquiry, then they will have direct experience in "science in the national interest."

I invite CAMP participants to visit our Web sites and consider whether a research internship might support your ultimate educational and career goals.

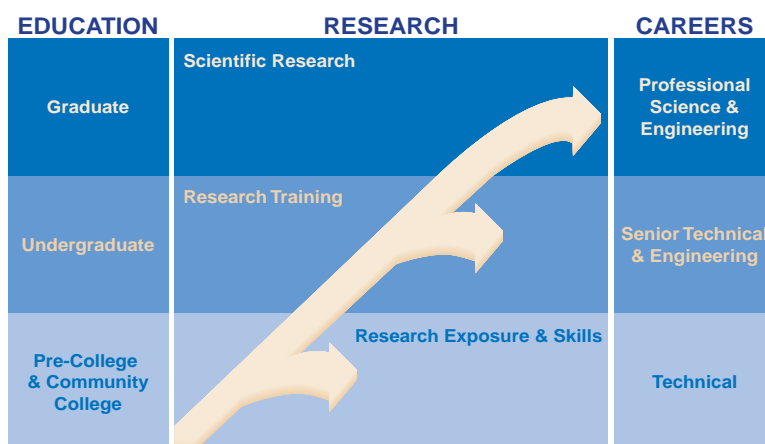


Figure 1.

A common theme of Livermore Lab's science education projects is the integration of education, research, and career counseling for students, especially undergraduates attending all types of two- and four-year colleges and universities.

Don Correll earned a B.S. in physics at Cal State Long Beach and a Ph.D. in plasma physics at UCI. He joined LLNL in 1976, and has taught plasma physics at UC Davis. His career has evolved from research scientist to science management to science education.

Figure 2.

Undergraduate Research Semester interns, above, have the opportunity to become involved in Department of Energy research, working with mentors or scientific teams engaged in long-range investigations and using advanced facilities and equipment. CAMP participants are encouraged to visit the URS Web site.

## Appendix 3

### Other Programs with Education Activities

The LLNL Science and Technology Program – <http://education.llnl.gov> – interacts closely with other LLNL educational activities which are managed by various areas within the Laboratory and are funded by different sources.

**University Relations Program (URP)** – <http://www.llnl.gov/urp/URPTop.html>

Encourages and expands research collaborations between Lawrence Livermore National Laboratory and universities, research organizations and industries.

**Summer Employment Program** – <http://www.llnl.gov/llnl/02summer/SEP.html>

Offers full-time science and technology summer research appointments – for up to 12 weeks – to undergraduate and graduate students, university faculty, high school/secondary teachers and, occasionally, high school students.

**Affirmative Action and Diversity Program (AADP)** – <http://www.llnl.gov/aadp/zoutrea.html>

Represents the Laboratory to diverse communities as a resource for employment, education, and commercial ventures. For example, the American Indian Program (AIP) independently reviews and prioritizes action items relating to American Indian issues for the Laboratory and DOE/HQ.

**Individual Laboratory Directorates, Divisions, and Programs** –

<http://www.llnl.gov/llnl/10org/direct.html>

Respond to unique needs as defined by the program content of the organization's education and outreach activities.

**UC Davis Department of Applied Science (DAS)** – <http://www.engr.ucdavis.edu/~das/>

Located adjacent to the Laboratory, DAS is a graduate department which specializes in applied science and has a large number of adjunct professors from Lawrence Livermore National Laboratory.

**Human Resources Department** – <http://eodd-server.llnl.gov/EODD/TE/>

Provides employees with a variety of education and training opportunities through several academic programs. Employees may pursue an undergraduate or graduate degree from a local university; enroll in job-related university courses; or view televised seminars and courses.

#### **Institutional Education Committee**

The STEP staff convened and continues to facilitate an LLNL Institutional Education Committee (IEC). This committee is made up of Laboratory administrators who oversee the various education activities, predominantly summer employment and student internships, across the Lab. The IEC facilitates communication among programs, minimizes the duplication of effort, and acts as a forum to advise upper management of identified issues. One example of the Committee's FY99 accomplishments was the creation of the STEP "electronic bulletin board" (<http://education.llnl.gov/sbb/>), which provides information about summer seminars and tours, and offers a mailing list and newsgroup as a means for LLNL students to learn about the Laboratory and network among themselves.



## Additional Opportunities for Students and Faculty Beyond STEP

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## **Undergraduate**

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### **Biology & Biotechnology Student Trainee Program**

The Biology & Biotechnology Research Program offers opportunities for undergraduate students to participate in laboratory research at Lawrence Livermore National Laboratory for educational and career development purposes. Students will have research opportunities relevant to their undergraduate program. Research areas include the DOE Human Genome Center, Molecular & Structural Biology Division, and Center for Health Care Technology.

#### **Requirements**

- Student must be enrolled in a recognized university at undergraduate level.
- Full-time student, although exceptions will be considered.
- Opportunities for outstanding high school seniors will be considered; must be 18 years or older.

#### **Length of Appointment**

12 months; renewable subject to satisfactory academic and research performance

#### **Stipend and Benefits**

- Students paid at competitive rates based on job assignment, academic achievement and relevant work experience.
- Students work less than 50% time during the academic year and up to 100% time during summer and academic breaks.

#### **Application Procedure and Deadlines**

Students complete LLNL external application. References and transcripts are required. Dates of hire are flexible.

#### **Contact**

Karen Johnson  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-452  
Livermore, CA 94551  
Phone (925) 423-6141  
e-mail: johnson41@llnl.gov

#### **Web Site**

<http://www-bio.llnl.gov/bbrp/bbrp.homepage.html>



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## ***Cooperative Education Program (COOP)***

The Affirmative Action and Diversity Program at Lawrence Livermore National Laboratory (LLNL) sponsors programs designed to increase the employment and educational opportunities for minorities, women, Vietnam-era veterans, and disabled persons.

COOP's objective is student work experience. This program offers students practical research experience while they are still in college. Students alternate semesters, working full-time at the Laboratory and working toward their degrees. The work experience supplements and reinforces academic training. Emphasis is on scientific and engineering disciplines. Appointments are for three to six months.

Opportunities are extremely limited and are only offered when funding is available. Interested persons may apply after the positions are listed in the Lawrence Livermore National Laboratory's employment bulletin.

### **Contact**

Frank Robles  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-716  
Livermore, CA 94551  
Phone: 925/422-0642  
e-mail: robles2@llnl.gov

### **Web Site**

<http://www.llnl.gov/aadp/>

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## ***Student Undergraduate Research Participation Program (Associated Western Universities (AWU))***

The Student Research Participation Program offers academically superior undergraduate students the chance to take part in energy-related science or in engineering research at Lawrence Livermore National Laboratory (LLNL). The goal is to encourage students to go on to either graduate school or a career as a scientist or engineer, and to help build collaborations between academic and LLNL scientists and engineers to promote the exchange of ideas, information and technology.

Eligible students apply through Associated Western Universities; AWU works with LLNL Science & Technology Education Program (STEP) to match qualified students with science research mentors who have requested student intern(s). In addition, a student who is participating in another student program at LLNL may, at the conclusion of that program, be eligible to continue with an identified science research mentor at LLNL through an AWU fellowship.

### **Requirements**

- At least one year of college study, although two years is preferred.
- U.S. citizen
- GPA of 3.0-4.0 and a commitment to completion of degree requirements

**Stipend and Benefits**

Varies; determined by LLNL mentor/department.

**Length of Appointment**

Varies – from 8-12 week summer fellowship to one year; may be renewed at the discretion of the LLNL mentor/department and AWU.

**Application Deadlines**

Suggested deadline of December 1 preceding the desired summer fellowship; applications accepted year-round.

**Contact**

Associated Western Universities  
4190 So. Highland Dr., Suite 211  
Salt Lake City, Utah 84124  
Phone (801) 273-8900  
AWU homepage at [www.awu.org](http://www.awu.org)  
or  
Science & Technology Education Program (STEP)  
Lawrence Livermore National Laboratory  
Beverly Williams  
Phone (925) 422-5020  
e-mail: [williams92@llnl.gov](mailto:williams92@llnl.gov)

**Web Site**

[www.awu.org](http://www.awu.org)

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**Summer Employment Program**

**(Lawrence Livermore National Laboratory)**

Lawrence Livermore National Laboratory offers full-time science and technology summer research appointments to undergraduate students, faculty, high school/secondary teachers and occasionally high school students. Participants in the Summer Employment Program come from academic institutions nationwide, both large and small, representing diverse cultural and academic backgrounds.

**Requirements**

- Must be a continuing student in good standing at an academic institution.
- U.S. citizenship required in most cases
- Selections and assignments are based on academic achievement, prior experience, technical interest and number of positions available.

**Stipend and Benefits**

- Students paid at competitive rates based on job assignment, academic achievement and relevant work experience.
- Travel expenses can be reimbursed as specified in the offer letter.
- Living accommodations are available in Livermore and surrounding communities. Accommodations can be acquired through the Laboratory's Housing Office.

**Length of Appointments**

Appointments are generally 12 weeks in length, from the middle of May to late September.

**Application Deadline**

By February 28 is preferred, to be considered for a summer position. Applications for summer employment are normally handled by mail rather than by personal interview.

**Contact**

Summer Employment Program  
Recruiting and Employment  
Lawrence Livermore National Laboratory  
P.O. Box 5925, L-725  
Livermore, CA 94551  
Phone (925) 424-3219

**Web Site**

<http://www.llnl.gov/llnl/02summer/SEP.html>

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***Undergraduate Summer Institute in Applied Science***

*(University of California, Davis/Livermore)*

For two weeks in August, about 30 outstanding science and engineering students entering their senior year at colleges and universities throughout the nation come to Lawrence Livermore National Laboratory for lectures, tours and to carry out research projects under the guidance of leading University of California faculty and LLNL researchers.

The Undergraduate Summer Institute in Applied Science provides participants with a unique opportunity to develop an understanding of the basic principles and state-of-the-art areas in applied science. The experience also provides a rare close-up look at how “big science” is performed.

Students attend morning lectures on applied science topics, followed by tours. Most afternoons are devoted to individual research projects, where students gain hands-on experimental, theoretical or computational experience.

The projects culminate in poster presentations on the last day of the Institute. The Institutes also schedule time for social and recreational activities. There are barbecues and luncheon get-togethers, a softball game, and a trip to San Francisco. There is also a weekend trip to Yosemite for hiking and field observations. An evening banquet concludes the two weeks.

**Requirements**

- Participants must be full-time undergraduate students in a recognized undergraduate physics, chemistry, materials science or engineering program who will achieve senior status by the fall following the Institute.
- A special effort is made to attract underrepresented and women students.
- U.S. citizen

**Length of Appointment**

The Institute is held in August.

The application forms indicate the exact dates.

**Stipend and Benefits**

The appointments cover travel and living expenses in addition to a \$1,000 award.

**Application Deadline**

January 31

**Application Procedure**

Undergraduate Summer Institute  
Lawrence Livermore National Laboratory  
The Department of Applied Science  
University of California, Davis/Livermore  
P.O. Box 808, L-353, Livermore, CA 94551

**Contact**

Kathleen Poeckert  
Lawrence Livermore National Laboratory  
Phone (925) 423-7709  
e-mail: poeckert1@llnl.gov

**Web Site**

<http://www.llnl.gov/usi/>

## Graduate

### **Graduate Student Term Employee**

*(Lawrence Livermore National Laboratory)*

In this program, graduate students from recognized universities are employed at Lawrence Livermore National Laboratory (LLNL) to work on projects related to their graduate studies.

#### **Requirements**

- Enrolled in an accredited graduate program.
- Assignment at LLNL is an integral and relevant part of the student's graduate program.

#### **Stipend**

- Salaries are established by the Laboratory program and are intended to reflect graduate research assistant salaries in comparable disciplines at UC campuses.
- LLNL provides office and equipment.
- Work schedules vary according to the individual graduate program.

#### **Length of Appointment**

One year and may be renewed up to a maximum of three years.  
The appointment may start any time during the year.

#### **Application Procedure**

Graduate student positions are posted in the Employment Opportunities Bulletin.

Web site: <http://wwwnt.llnl.gov/jobs/joblist.htm>

Applicants submit an application, transcripts and "Request for Graduate Student Term Status" completed by their graduate advisor.

#### **Contact**

Don Hoffman  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-728  
Livermore, CA 94551  
Phone (925) 424-5482  
FAX: (925) 422-9613  
e-mail: [hoffman7@llnl.gov](mailto:hoffman7@llnl.gov)

#### **Web Site**

<http://wwwnt.llnl.gov/jobs/joblist.htm>

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## **Department of Applied Science - Student Employee Program**

*(University of California, Davis/Livermore)*

The Student Employee Program is jointly sponsored by Lawrence Livermore National Laboratory (LLNL) and Department of Applied Science (DAS), University of California, Davis. It provides part-time employment for a limited number of students pursuing graduate degrees in applied science or computer science. The program is managed by the Student Policy Committee.

### **Requirements**

- Accepted into the graduate division at UC Davis
- U.S. citizen
- Strong undergraduate academic background

### **Stipend and Benefits**

- Salary rates are set each year by LLNL's Compensation Division in conjunction with the Student Policy Committee
- Resident (in-state) tuition paid, first year of non-resident tuition paid
- LLNL benefits

### **Length of Appointment**

- Masters - two years
- Ph.D. - five years
- Students work 50%-time during school year and full time in the summer

### **Application Deadline**

- Selections are made in the spring of each year.
- Students accepted at UC Davis are reviewed by the Chairman of DAS.

### **Contact**

Dee Kindelt, Student Program Administrator  
University of California, Davis  
Department of Applied Science  
P.O. Box 808, L-794  
Livermore, CA 94551

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## **Graduate Fellowships**

*(Associated Western Universities)*

Graduate Fellowships support research participation and access to the unique resources at Lawrence Livermore National Laboratory (LLNL). Opportunities are available for graduate students to conduct that portion of their thesis (or dissertation) research, which requires special facilities not available at the applicant's home institution. The objectives of this program are to develop long-term collaborative relationships between facility researchers and young investigators, and to encourage graduate students to pursue careers in research.

**Requirements**

- Must be master's or doctoral degree candidates at accredited U.S. colleges and universities
- U.S. citizen

**Stipend and Benefits**

The stipend is established by the host facility. Travel and relocation depend upon prevailing facility practice.

**Length of Appointment**

Fellowship terms are variable; renewable up to a cumulative total of 12 months.

**Application Deadline**

Applications may be submitted at any time. Complete applications received by February 1st will be given full consideration for summer fellowships.

**Contact**

Associated Western Universities  
4190 South Highland Drive, Suite 211  
Salt Lake City, Utah 84124  
Phone: (801) 273-8900  
Mariann Bleazard (801) 273-8911  
AWU homepage at [www.awu.org](http://www.awu.org)  
or  
Science & Technology Education Program (STEP)  
Lawrence Livermore National Laboratory  
Beverly Williams  
Phone (925) 422-5020  
e-mail: [williams92@llnl.gov](mailto:williams92@llnl.gov)

**Web Site**

[www.awu.org](http://www.awu.org)

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### ***National Physical Science Consortium Graduate Fellowship Program in the Physical Sciences***

This is a unique six-year doctoral fellowship program in astronomy, chemistry, computer science, geology, materials science, mathematics or physics and their sub-disciplines.

The total estimated value of the fellowship can be as much as \$200,000 depending on the cost of the university attended by the fellow. The consortium is comprised of a growing number of leading universities that provide full tuition and fees and private corporations and government agencies.



### **Requirements**

- Applications will be accepted ONLY for study and research for a doctoral degree.
- Applications will be accepted from individuals who are about to receive their baccalaureate degree; or those who have been out in the work force or U.S. Military services for 1 year or more.
- U.S. citizen
- Minimum GPA of 3.0 on a scale of 4 points
- Students currently enrolled in a masters or Ph.D. program at a Ph.D. granting institution are NOT eligible.

### **Stipend and Benefits**

- \$12,500 for the first 4 years
- \$15,000 for years 5 and 6
- The employer sponsor provides two summers of employment; the university provides 6 years of tuition and fees while fellows complete their degree requirements.

### **Length of Appointment**

Six years

### **Application Deadline**

November 5 - applications, transcripts and letters of recommendation must be received by the NPSC Student Recruitment Office. Applications are available at our Web site:  
<http://www.npsc.org>

### **Contact**

National Physical Science Consortium  
Student Recruitment Office, MSC-3NPS  
Box 30001, Las Cruces, New Mexico 88003-8001.  
Phone: 1-800-952-4118. Fax: (505) 646-6097  
e-mail: [npssc@nmsu.edu](mailto:npssc@nmsu.edu).

### **Web Site**

<http://www.npsc.org>

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## **Summer Employment Program**

### **(Lawrence Livermore National Laboratory)**

Lawrence Livermore National Laboratory offers full-time science and technology summer research appointments to graduate students. Participants in the Summer Employment Program come from academic institutions nationwide, both large and small, representing diverse cultural and academic backgrounds.

### **Requirements**

- Positions are for graduate students who are going on to graduate school.
- Selections and assignments are based on academic achievement, prior experience, technical interest and number of positions available.
- U.S. citizenship required in most cases.
- Proof of acceptance in graduate school is required at time of offer.

**Stipend and Benefits**

- Students paid at competitive rates based on job assignment, academic achievement and relevant work experience.
- Travel expenses can be reimbursed as specified in the offer letter.
- Living accommodations are available in Livermore and surrounding communities. Accommodations can be acquired through the Laboratory's Housing Office.

**Length of Appointments**

Appointments are generally 12 weeks in length, from the middle of May to late September.

**Application Deadline**

By February 28 is preferred, to be considered for a summer position. Applications for summer employment are normally handled by mail rather than by personal interview.

**Contact**

Summer Employment Program  
Recruiting and Employment  
Lawrence Livermore National Laboratory  
P.O. Box 5925, L-725  
Livermore, CA 94551  
Phone (925) 424-3219

**Web Site**

<http://www.llnl.gov/llnl/02summer/SEP.html>

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***University of California Institutes Program******University Collaboration Research Program***

University Collaboration Research Program sponsored by the UC Institutes, has calls for proposals to all University of California campuses each year. This is a competitive solicitation for Principal Investigators, postdocs, and students to work with LLNL scientists to carry out research that fits the Institute's and Lawrence Livermore National Laboratory's mission.

The Institutes are: Center for Accelerator Mass Spectrometry (CAMS), Institute of Geophysics and Planetary Physics (IGPP), Institute for Scientific Computing Research (ISCR), the Materials Research Institute (MRI), and the Institute for Laser Science and Applications (ILSA).

**Requirements**

Principal Investigator needs to gain this privilege from their home institution, and locate a scientist at LLNL as collaborator, before submitting proposals.

**Stipend & Benefits**

Follow the guideline in the Call for Proposals

**Length of Support**

One year and renewable depending on progress

**Application Deadline**

Various

**Contact**

Christina Budwine, Assistant Director  
University Relations Program  
Lawrence Livermore National Laboratory  
P. O. Box 808, L-413, Livermore, CA 94551  
Phone (925) 423-4476  
e-mail: budwine2@llnl.gov

CAMS - John Knezovich, Director  
Phone (925) 422-0925; e-mail: knezovich1@llnl.gov

IGPP - Charles Alcock, Director  
Phone (925) 423-0666; e-mail: alcock1@llnl.gov

ISCR - David Keyes, Director  
Phone (925) 422-8596; e-mail: keyes3@llnl.gov

MRI - Harry Radousky, Acting Director  
Phone (925) 422-4478; e-mail: radousky1@llnl.gov

ILSA - Hector Baldis  
Phone (925) 422-0101; e-mail: baldis1@llnl.gov

**Web Site**

<http://www.llnl.gov:80/urp/Institutes.html>

## *Postdoctoral*

### *Alexander Hollaender Distinguished Postdoctoral Fellowship Program*

The Alexander Hollaender Distinguished Postdoctoral Fellowship Program (ALEX) offers challenging opportunities to recent recipients of doctoral degrees to conduct research in areas supportive of the mission of the Office of Biology and Environmental Research. Appropriate research areas are in the biological, biomedical, and environmental sciences, including the Human Genome Project.

Fellows become trained in advanced energy research related to health and the environment, interact with outstanding professionals, and become familiar with energy-related national issues while making personal contributions to the search for solutions.

#### **Requirements**

- Applicants must have received a research doctoral degree in an appropriate scientific or engineering discipline after April 30, 1998.
- U.S. citizen or PRA
- Appointment must be initiated after May 1 and before September 30, 2000.

#### **Stipend and Benefits**

- \$37,500 for first-year fellows
- \$40,500 for second-year renewal fellowships

#### **Length of Appointment**

One year, renewable for a second year

#### **Application Deadline**

January 15 of each awarding year  
Fellowship offers will be made in April.

#### **Contact for Biology and Biotechnology Research Program**

Dr. Harvey Mohrenweiser  
Biology and Biotechnology Research Program  
Lawrence Livermore National Laboratory  
Phone (925) 423-0534  
e-mail: mohrenweiser1@llnl.gov

Contact for Environmental Sciences Program:

Dr. David Layton  
Phone (925) 422-0918  
e-mail: layton1@llnl.gov

#### **Web Site**

<http://www-bio.llnl.gov/bbrp/bbrp.homepage.html>

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## **Lawrence Livermore Fellowship**

The Director of Lawrence Livermore National Laboratory has initiated the Lawrence Livermore Fellowship, which is a distinguished postdoctoral fellows program. The fellows will have world class resources to support their research. Two positions are immediately available and two additional fellowships will be available every year to reach a maximum of six positions (three years).

Fellows will do original, independent research in one or more aspects of science relevant to the competencies at LLNL. Research areas may include Physics (Condensed Matter Physics, Astrophysics, Fusion and Plasma Physics), Computer Science, Chemistry, Materials Science, Engineering, Environmental Science, Energy, Laser Science, and Biological Science. The identified research area should relate to LLNL's science and technology goals.

Successful candidates may participate in experimental or theoretical work at LLNL and will have access to LLNL's extensive computing facilities, specialized laboratory facilities, and field equipment. A senior staff scientist will serve as a mentor to each of the fellows. The fellows will receive full management and administrative support..

### **Duties, Skills & Requirements**

- Conduct original and independent research
- Report research results in LLNL seminars/major scientific conferences
- Publish research results in refereed journals
- Contribute to, and stimulate, the scientific vitality of the Lab
- Security clearance may be required
- Ph.D. in a relevant scientific field within the past 5 years
- Demonstrated creativity, exceptional ability, and superior knowledge in the applicant's area of specialization
- Excellent written and verbal communication skills
- Experience in writing reports, publications, and proposals
- Able to work independently as well as in team environment

### **Stipend and Benefits**

Salary is \$6,000 a month.

### **Length of Appointment**

This is a three-year term appointment

### **Contacts**

Kristine Kansa, Human Resources Employment Representative  
Lawrence Livermore National Laboratory  
7000 East Avenue - L-725, Livermore, CA 94550  
Phone: 925/422-8144, e-mail: kansa2@llnl.gov  
OR

Chris Budwine, Assistant Director for Operations & Resources  
University Relations Program, L-413  
Phone: 925/423-4476  
e-mail: budwine2@llnl.gov

### **Web Site**

[www.llnl.gov/urp/LLNLPostDoc/LLNLPostDoc.htm](http://www.llnl.gov/urp/LLNLPostDoc/LLNLPostDoc.htm)

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## ***Postdoctoral Fellowships with the Glenn T. Seaborg Institute for Transactinium Science***

The Glenn T. Seaborg Institute for Transactinium Science (ITS) was established to foster the fundamental and applied science and technology of the transactinium elements which begin with thorium (element 90) and extend through the heaviest element. The ITS offers research opportunities for both experimental and theoretical studies of these elements in areas such as environmental and solution chemistry, absorption and emission spectroscopy, and studies of nuclear and chemical properties.

### **Requirements**

- A Ph.D. in chemistry, physics or a related field and interest in transactinium science is required.
- U.S. citizen or PRA

### **Stipend and Benefits**

- Fellowships include stipend, transportation and relocation fees.
- The fellowships may include travel subsidies.

### **Length of Appointment**

One year, renewable for a second year

### **Application Deadline**

March 3: curriculum vitae including publication list, two letters of reference, a letter of recommendation from the academic research advisor, and copies of undergraduate and graduate transcripts.

### **Contact**

The Glenn T. Seaborg Institute for Transactinium Science  
Attention: Dr. Louis J. Terminello  
Lawrence Livermore National Laboratory  
P.O. Box 808, Mail Stop L-357  
Livermore, CA 94551  
Phone (925) 423-3755 or (925) 423-5031  
Fax (925) 422-3160  
e-mail: ITS@cms.llnl.gov

### **Web Site**

<http://www.cms.llnl.gov/its/index.html>



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## **University of California Institutes Program**

### **University Collaboration Research Program**

University Collaboration Research Program sponsored by the UC Institutes, has calls for proposals to all University of California campuses each year. This is a competitive solicitation for Principal Investigators, postdocs, and students to work with LLNL scientists to carry out research that fits the Institute's and Lawrence Livermore National Laboratory's mission.

The Institutes are: Center for Accelerator Mass Spectrometry (CAMS), Institute of Geophysics and Planetary Physics (IGPP), Institute for Scientific Computing Research (ISCR), the Materials Research Institute (MRI), and the Institute for Laser Science and Applications (ILSA).

#### **Requirements**

Principal Investigator needs to gain this privilege from their home institution, and locate a scientist at LLNL as collaborator, before submitting proposals.

#### **Stipend & Benefits**

Follow the guideline in the Call for Proposals

#### **Length of Support**

One year and renewable depending on progress

#### **Application Deadline**

Various

#### **Contact**

Christina Budwine, Assistant Director  
University Relations Program  
Lawrence Livermore National Laboratory  
P. O. Box 808, L-413, Livermore, CA 94551  
Phone (925) 423-4476  
e-mail: budwine2@llnl.gov

CAMS - John Knezovich, Director  
Phone (925) 422-0925; e-mail: knezovich1@llnl.gov

IGPP - Charles Alcock, Director  
Phone (925) 423-0666; e-mail: alcock1@llnl.gov

ISCR - David Keyes, Director  
Phone (925) 422-8596; e-mail: keyes3@llnl.gov

MRI - Harry Radousky, Acting Director  
Phone (925) 422-4478; e-mail: radousky1@llnl.gov

ILSA - Hector Baldis  
Phone (925) 422-0101; e-mail: baldis1@llnl.gov

#### **Web Site**

<http://www.llnl.gov:80/urp/Institutes.html>

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***University of California Presidential Postdoctoral Fellowship Program  
at LLNL***

This is a yearly fellowship selected and awarded by the UC Office of the President (UCOP). The call for proposals is sent out annually in October to all universities in the United States. UC campuses are eligible to participate as mentor locations. Lawrence Livermore National Laboratory is a participating mentorship site for research.

**Requirements**

U.S. citizen, within 5 years of Ph.D. degree

**Stipend and Benefits**

Based on UC scale

**Length of Appointment**

2 years

**Application Deadline**

December of each year

**Contact**

Christina Budwine  
Assistant Director  
University Relations Program  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-413  
Livermore, CA 94551  
Phone (925) 423-4476  
e-mail: budwine@llnl.gov

**Special**

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***Apprenticeship/Pre-apprenticeship Program***

The Affirmative Action and Diversity Program at Lawrence Livermore National Laboratory (LLNL) sponsors programs designed to increase the employment and educational opportunities for minorities, women, Vietnam-era veterans, and disabled persons.

The Apprenticeship/Pre-apprenticeship Program's objective is career-directed employment. This program provides training and experience leading to state certification as journey workers in a variety of skilled and technical occupations.

**Contact**

Lee Bennett  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-578  
Livermore, CA. 94551  
Phone (925) 422-8080  
e-mail: bennett10@llnl.gov

**Web Site**

<http://www.llnl.gov/aadp/>

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***Diné Community College Scholarship Program***

***For Diné Community College students only***

This program provides financial support in the form of scholarships and summer employment for Diné Community College students majoring in engineering and computer science.

**Requirements**

- Must be a student in good standing majoring in an energy-related field at one of the Dine Community College campuses
- Maintain a 3.0 GPA

**Stipend and Benefits**

- Salaries are set from a Student Rate Scale, determined by discipline, education and experience.
- Students also receive reimbursement for travel expenses to and from Lawrence Livermore National Laboratory.
- Students receive \$2,000 per year for tuition and books.

**Length of Appointment**

Usually 12 weeks, between May and September 30.

**Application Deadline**

March of each year

**Contact**

Recruiting and Diversity Manager for Engineering  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-151  
Livermore, CA. 94551  
Phone (925) 422-8373  
e-mail: mcdavid2@llnl.gov

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***On-the-Job Training (OJT)***

The Affirmative Action and Diversity Program at Lawrence Livermore National Laboratory (LLNL) sponsors work experience programs designed to increase the employment and educational opportunities for minorities, women, Vietnam-era veterans, and disabled persons.

The On-the-Job Training program's objective is career-directed employment. This program provides clerical and technical skills training to individuals who have limited marketable skills and who are unemployed or underemployed. OJT participants are placed in technical and clerical positions throughout the Laboratory. Successful completion of the training and existence of an appropriate opening can lead to career employment at LLNL. Appointments are from one to two years.

Opportunities are extremely limited and are only offered when funding is available. Interested persons may apply after the positions are listed in the Lawrence Livermore National Laboratory's employment bulletin.

**Contact**

Frank Robles  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-716  
Livermore, CA. 94551  
Phone (925) 422-0642  
e-mail: robles2@llnl.gov

**Web Site**

<http://www.llnl.gov/aadp/>

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### ***Post-College Appointment Program (PCA)***

The Affirmative Action and Diversity Program at Lawrence Livermore National Laboratory (LLNL) sponsors work experience programs designed to increase the employment and educational opportunities for minorities, women, Vietnam-era veterans, and disabled persons.

The PCA Program's objective is career-directed employment. This program provides relevant work experience to individuals who have completed the academic requirements normally associated with professional career employment in science and engineering. Participants work full-time. Appointments are for one or two years.

Opportunities are extremely limited and are only offered when funding is available. Interested persons may apply after the positions are listed in the Lawrence Livermore National Laboratory's employment bulletin.

#### **Contact**

Frank Robles  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-716  
Livermore, CA. 94551  
Phone (925) 422-0642  
e-mail: robles2@llnl.gov

#### **Web Site**

<http://www.llnl.gov/aadp>

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### ***Research Collaborations Program for Historically Black Colleges and Universities and Minority Institutions***

#### ***(Historically Black Colleges and Universities and Minority Institutions)***

The LLNL Research Collaborations Program for Historically Black Colleges and Universities (HBCUs) and other Minority Institutions (MIs) is a Laboratory-wide program that develops and promotes productive and mutually beneficial scientific collaborations between LLNL and the nation's HBCUs and MIs. The collaborations link accomplished faculty and students from these institutions with LLNL principal investigators in research that supports LLNL and DOE programmatic missions. The Research Collaborations Program builds upon the research capabilities that already exist at the schools and enhances these capabilities through access to the unique facilities and expertise at LLNL. In doing this, the program also expands the schools' capacity for training students in the sciences and related disciplines.

In these collaborations professors and students participate in leading edge research in a wide variety of disciplines – such as nonlinear optics, atomic physics, materials science, spectroscopy, plasma diagnostics and massively parallel computing. They make presentations at national and international symposia and conferences, and they are frequently co-authors with LLNL principal investigators on publications stemming from the research. The participants also have the opportunity to expand their connections with the larger scientific community through interactions with scientists from other institutions who collaborate with LLNL.

The Research Collaborations Program provides opportunities for graduate students and undergraduate students to have significant and enriching research experiences at LLNL and on

their home campuses. Faculty and student participants can come to LLNL during summer and semester breaks, but the cooperative research continues throughout the year – at the schools and at LLNL. In some cases LLNL scientists have visited the schools to present seminars and to help with the research on campus, and for some collaborations the program has made equipment, computers and software available to support the research at the school

The professors and students in this program have made important contributions to basic and applied research efforts at LLNL. Also, a significant number of the undergraduate participants have entered graduate programs in the physical sciences. A major goal of the program is to increase the number of Minority students entering science and technology careers – particularly in disciplines which are important to LLNL and DOE.

#### **Contact**

Dr. Kennedy Reed, Physics Department  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-041  
Livermore, CA 94551  
Phone (925) 423-1112  
e-mail: reed5@llnl.gov

#### **Web Site**

<http://www.llnl.gov:80/urp/HBCU/homepage.html>

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### **Science and Engineering Alliance**

***For students of Jackson State University, Alabama A&M University, Prairie View A&M University, and Southern University and A&M College only***

The SEA collaborates on research projects for government agencies, the private sector and other universities in a broad range of scientific and technical disciplines. The SEA is an incorporated, not-for-profit consortium of four Historically Black Colleges and Universities (HBCUs) located in Alabama, Mississippi, Louisiana and Texas.

The SEA universities have significant resources for conducting research and training in science and engineering. These resources include modern, well-equipped laboratories in optics, lasers, physical chemistry, biochemistry, environmental and materials research. The SEA facilities are available for studying heat transfer, process control with computer simulation, high energy physics, surface physics, chemical manufacturing, and material analysis.

The SEA provides financial support to faculty members and students. The support consists of scholarships to undergraduate students, incentive awards to high school students that have demonstrated an interest in science and mathematics, and faculty and student travel to technical conferences, workshops and seminars.

In addition, LLNL/SEA faculty and student summer research programs are available.

#### **Contacts**

SEA Headquarters	Dr. Robert Shepard	(202) 842-0403
Jackson State University	Dr. Betty Ward Fletcher	(601) 968-2455
Alabama A&M University	Dr. Jeanete Jones	(205) 851-5675
Prairie View A&M University	Dr. Willie F. Trotty	(409) 857-4521
Southern University and A&M College	Dr. William E. Moore	(504) 771-2360
LLNL SEA Program Manager	Ellen Hill	(925) 422-0894

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## **TEMP/TERM Assignments**

The Affirmative Action and Diversity Program at Lawrence Livermore National Laboratory (LLNL) sponsors work experience programs designed to increase the employment and educational opportunities for minorities, women, Vietnam-era veterans, and disabled persons.

The TEMP/TERM Assignments program's objective is work experience. This program provides work experience in short-term (11 months to 5 years) assignments; it also awards temporary or term appointments for graduate research and minority faculty exchange.

Opportunities are extremely limited and are only offered when funding is available. Interested persons may apply after the positions are listed in the Lawrence Livermore National Laboratory's employment bulletin.

### **Contact**

Frank Robles  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-716  
Livermore, CA. 94551  
Phone (925) 422-0642  
e-mail: [robles2@llnl.gov](mailto:robles2@llnl.gov)

### **Web Site**

<http://www.llnl.gov/aadp>



## *Faculty*

### **Summer Employment Program**

*(Lawrence Livermore National Laboratory)*

Lawrence Livermore National Laboratory offers full-time science and technology summer research appointments to undergraduate and graduate students, faculty, high school/secondary teachers and occasionally high school students. Participants in the Summer Employment Program come from academic institutions nationwide, both large and small, representing diverse cultural and academic backgrounds.

#### **Requirements**

- Must be a teacher or faculty member in good standing at an academic institution.
- U.S. citizenship required in most cases
- Selections and assignments are based on academic achievement, prior experience, technical interest and number of positions available.

#### **Stipend and Benefits**

- University/college faculty members may be paid at their academic rate.
- Travel expenses can be reimbursed as specified in the offer letter.
- Living accommodations are available in Livermore and surrounding communities. Accommodations can be acquired through the Laboratory's Housing Office.

#### **Length of Appointments**

Appointments generally are generally 12 weeks in length, from the middle of May to late September.

#### **Application Deadline**

By February 28 is preferred, to be considered for a summer position. Applications for summer employment are normally handled by mail rather than by personal interview.

#### **Contact**

Summer Employment Program  
Recruiting and Employment  
Lawrence Livermore National Laboratory  
P.O. Box 5925, L-725  
Livermore, CA 94551  
Phone (925) 424-3219

#### **Web Site**

<http://www.llnl.gov/llnl/02summer/SEP.html>

## **Pre-College**

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### **Engineering Administrative Outreach**

#### **Summer Program**

Summer jobs for local high school and junior college students interested in pursuing careers in the clerical or administrative fields. Goal is preparation to become competitive applicants for administrative assignments upon graduation.

#### **Requirements**

- Enrolled full time in high school or junior college.

#### **Stipend and Benefits**

- Completion of junior year high school: \$6.50/hour
- Completion of senior year high school: \$7.00/hour
- Junior college rate table varies

#### **Length of Appointment**

- Usually 12 weeks between June and September 30
- Based on funding considerations, programmatic need, and availability of student, may be offered temporary indeterminate positions to work part time during the school year.
- GPA 2.5 must be maintained and be full time student to continue program.

#### **LLNL Supervisor's Responsibility**

- Experienced lead or supervisory administrative personnel provide close day-to-day mentorship and coaching.
- Training and assignments are dependent upon job descriptions.
- Expectations and goals are discussed with student at beginning of assignment, and an evaluation is conducted at end of summer assignment.

#### **Application Deadline and Procedure**

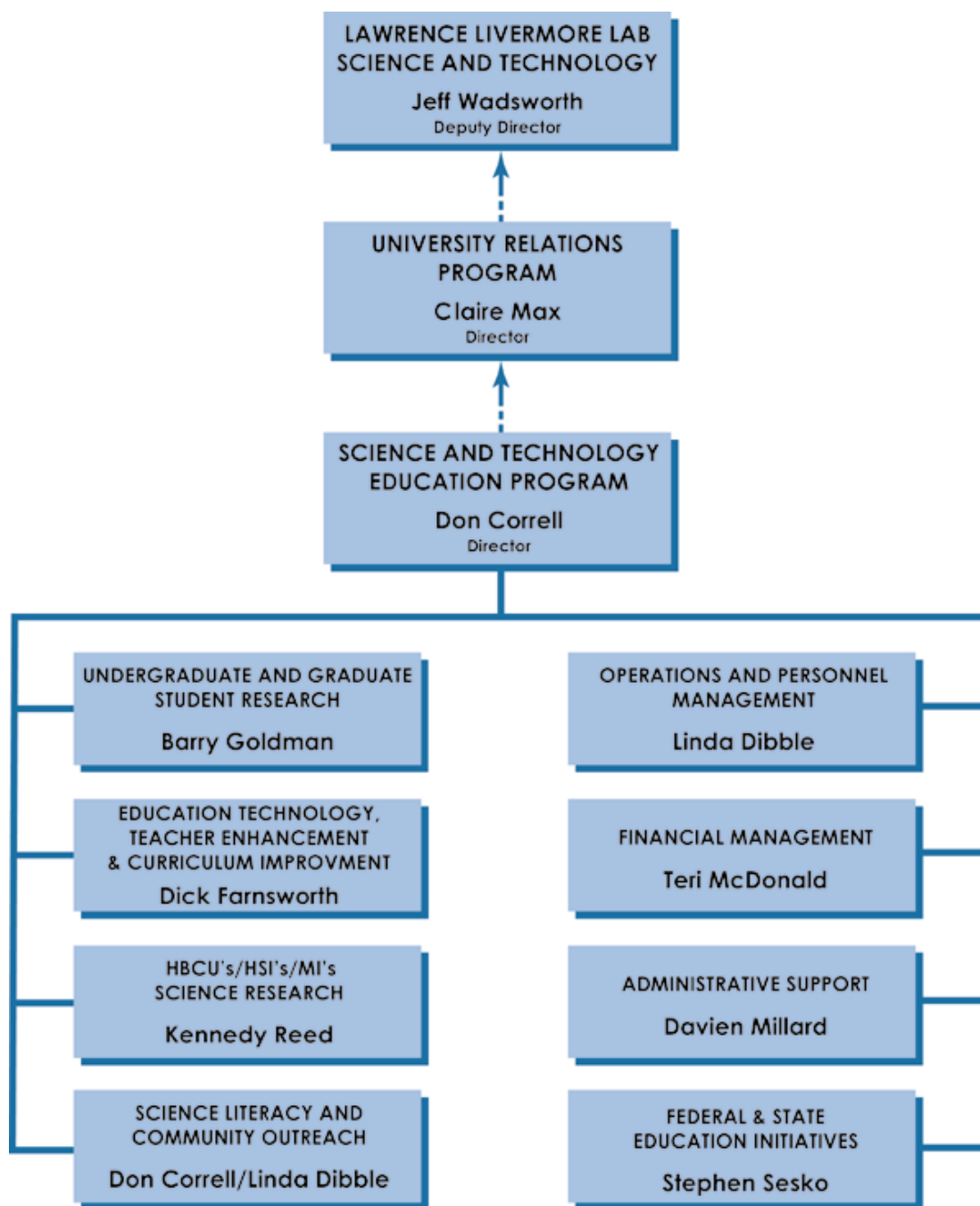
A subcommittee has been established to contact targeted local schools and make presentations about the program. Instructors are asked to recommend students for the program based on selection criteria. Interviews are conducted at the schools; screened and selected candidates are notified.

#### **Contact**

Engineering Administrative Outreach Program  
Rita Bonivert  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-123  
Livermore, CA 94551  
Phone (925) 423-5869  
e-mail: bonivert2@llnl.gov

## Appendix 4 STEP Project Contacts

### Organization Chart



## **Science & Technology Education Program Office and Project Managers**

<b>Name</b>	<b>Phone Number</b>	<b>Fax Number</b>	<b>E-mail Address</b>
Correll, Don	(925) 422-6784	(925) 422-5761	correll1@llnl.gov
Dibble, Linda	(925) 423-8651	(925) 422-5761	dibble2@llnl.gov
Farnsworth, Dick	(925) 422-5059	(925) 422-6079	farnsworth1@llnl.gov
Goldman, Barry	(925) 422-5177	(925) 422-6079	goldman1@llnl.gov
McDonald, Teri	(925) 422-7700	(925) 422-6079	mcdonald12@llnl.gov
Millard, Davien	(925) 422-5460	(925) 422-5761	millard1@llnl.gov
Reed, Kennedy	(925) 423-1112	(925) 423-7228	reed5@llnl.gov
Sesko, Stephen	(925) 422-5385	(925) 422-6079	sesko1@llnl.gov
Williams, Beverly	(925) 422-5020	(925) 422-6079	williams92@llnl.gov

### **Science & Technology Education Program (STEP)**

Lawrence Livermore National Laboratory  
7000 East Ave, L-428  
Livermore, CA 94550

Phone: (925) 422-5460

E-mail: [education@llnl.gov](mailto:education@llnl.gov)

Web site: <http://education.llnl.gov/>





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